CRENO

ADVANCED MACHINING SOLUTIONS FOR THE AERONAUTICS INDUSTRY

creno-industry.com

CRENO: a key partner for the global aeronautics industry

CRENO has been developing **innovative machining solutions,** combining machines and processes, since its foundation in 1978 in Annecy, France.

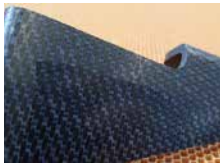
For the last fifteen years, the company has been focusing on specific processes in the **aeronautics sector** for which we have designed highly differentiated solutions.

We are currently working with major aeronautics stakeholders mainly in Europe, North America and Asia.

Going beyond our initial expertise in highly accurate robust, **multi axis CNC machines** – with 3, 5, or more axis – dedicated to “soft” materials such as aluminum or composites, we have developed advanced and efficient innovative processes, specifically for:

Multi-drilling “acoustic drilling” of composite nacelles

Machining and Ultrasonic Cutting of Honeycomb



Milling of composite parts

Routing and drilling aluminum sheet stacks

To provide an answer to our customer and market evolution we have developed **machining robot cells** able to carry all our processes.

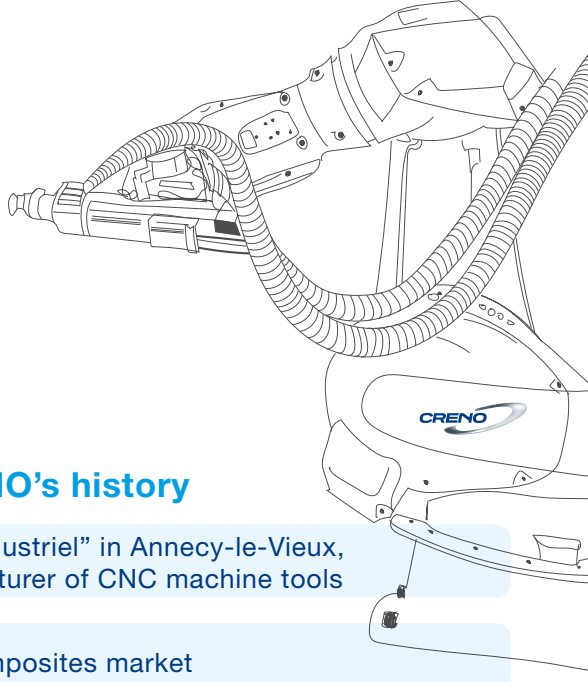
Our Core Values

- Customized and Turnkey Solutions
- A Committed Team
- A Long-Term Relationship

CRENO,
Pioneering with You and for You

Providing pioneering turnkey machining and robotic systems for the **aeronautics, aerospace and composite industry** since 1978, CRENO offers innovative and robust solutions worldwide on multi-axis CNC machines and industrial robots.

Its mission is to guarantee its customers **to stay one step ahead of their competitors** with a customized machine/process combination, its reliability and integration into physical and numerical industrial workflows.



Some key dates in CRENO's history

1978 — Foundation of "Le Créneau Industriel" in Annecy-le-Vieux, France, designer and manufacturer of CNC machine tools

1980 — First CNC machine for the composites market

1984 — First 5-axis CNC machine

1985 — First high-speed milling machine

1988 — First multi-drilling machine for wood panels

Beginning of Aeronautic market penetration

1999 — First stack router "bridge cut" machine, *for* LATÉCOÈRE

2004 — First high-speed drilling machine for the aeronautics industry, *for* SAFRAN

2010 — First combined ultrasonic and milling machine, *for* AIRBUS

2017 — First CRENO Siemens NC-controlled robot cell, *for* HUTCHINSON

2020

NEW

DUAL ACE

"The most competitive Ultrasonic Cutting machine worldwide"

Multi-Drilling Solution of Nacelle Parts

Jet engines are subjected to very strict standards to gradually reduce noise levels. To achieve these goals, they contain **composite panels** with hundreds of thousands of small-diameter holes, generally from 0.55 to 1.8mm. These micro-drilled engine panels act as **sound traps.**

For the past 15 years, and to respond to this very demanding quality and productivity criteria, CRENO has become an expert in **“acoustic drilling”** with 5-axis machines.

Spearheading industrial innovation, CRENO has developed an acoustic drilling Robot Cell using a Siemens NC-controlled Stäubli robot.

With over 10 years of experience, our multi-spindle technology has become a proven solution:

Recognized expertise

- Over 15 drilling machines sold in Europe and North America for Safran, GE-MRAS, UTC Aerospace, and Spirit Aviation
- Process validated by Airbus, Boeing, Bombardier, Comac, and Mitsubishi
- High production performance: Up to 35 holes per second
- Up to 28 spindles on one drilling head
- Drilling cycle below 0.8 seconds

Increased hole quality

- Diameters ranging from 0.55 to 2mm (0.021 to 0.08 inch)
- High precision and less delamination
- Individually controlled drill-hole depth
- No need to add additional finition
- Stability of the process
- Expertise in cutting tools

Continuous monitoring

- Drilling process control
- Drill bit breakage detection
- Drill bit lifecycle management

Highly automatic

- Reduced operator intervention
- Friendly and ergonomic configuration

5-Axis Machine

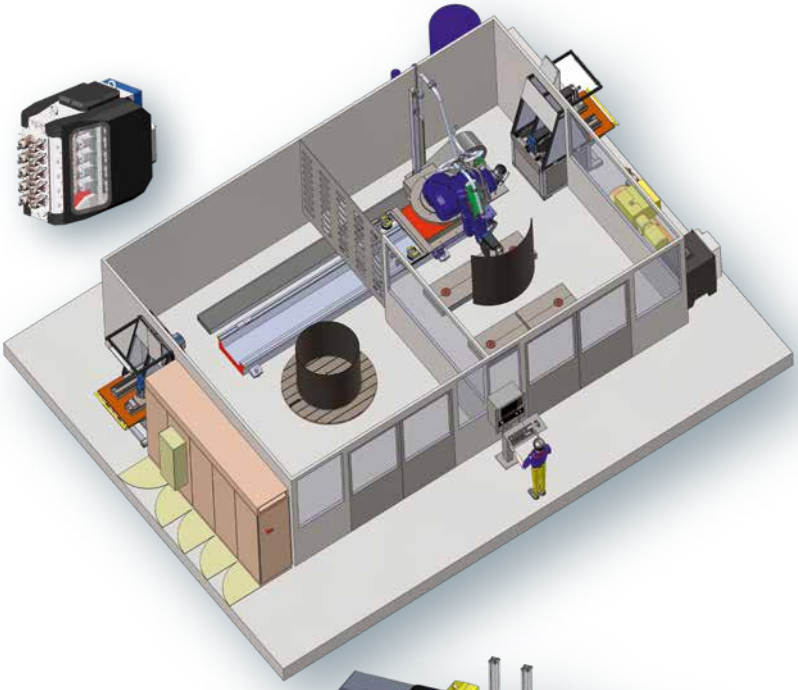
Micro drilling of acoustic panels dedicated to large parts

- High production level
- Drilling heads with up to 28 spindles
- Up to 35 holes per second (28 holes every 0.8 s)
- High rigidity
- High stability

Robot Cell

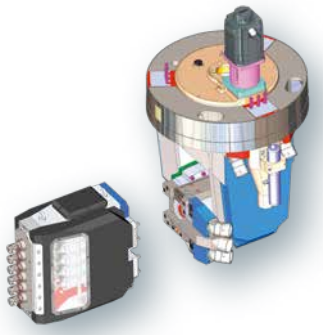
Robotic acoustic drilling dedicated to smaller or cylindrical parts

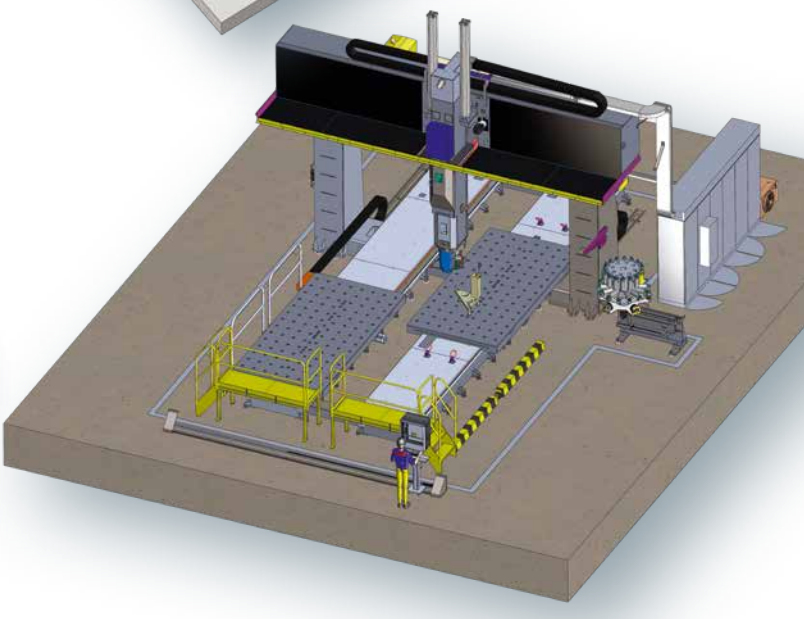
- Saves floor space using standard foundations
- Each spindle is individually assembled on a linear axis used for the drilling motion
- Easy and cost-effective spindle reconfiguration
- Ease of integration in industrial workflows (inline integration)
- Drilling heads with up to 12 spindles
- Up to 12 holes per second
- Siemens NC (ISO code)



Combined Process

- Milling and multi-drilling of composite parts
- Customized size of the machine
- Milling spindle up to 42 KW and 24 000 rpm
- Multi-drilling heads up to 6 independent spindles
- Two processes in one





Machining and Ultrasonic Cutting of Honeycomb

Honeycomb materials and structures are increasingly used in the aeronautics industry. Machining these materials using traditional methods is often complex, costly, and unsatisfactory in terms of quality and accuracy. CRENO has developed a unique solution for these materials by combining the advantages of the **ultrasonic cutting process** and **traditional milling machines.**

The advantages of CRENO solutions

- No dust
- Reduced cutting force
- Unrivalled quality due to the absence of deformed cells and lint
- Significantly reduced cycle time (up to three times faster)
- Increased ultrasonic tool life span
- Possibility to realize complex geometries

CRENO Machining and Ultrasonic Cutting of Honeycomb

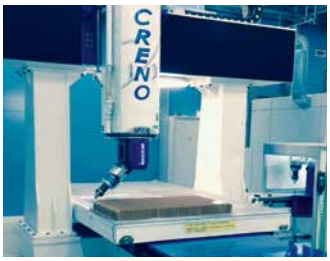
CRENO 5-axis cutting machines combine traditional milling and ultrasonic cutting quality in one machine. It is therefore possible to machine composite skins, honeycomb materials, and bonded parts. This solution offers the opportunity to work on a wide range of materials and shapes, in particular when cutting small parts at high-speeds.

5-Axis Machine

Dual Ace

- Standard machine with working area: 2.5x1.2x0.9m (8.2x4.1x3 ft)
- Siemens 840 D SL Numerical control
- Milling spindle 10 KW / 24 000 rpm / HSK 63
- Up to 4 CRENO ultrasonic heads
- CRENO know how and software solutions for programming
- Best price on the market

Customized



- Customized size of the machine up to 20m (66ft) x 9m (30 ft) x 2.5m (8.2ft)
- Milling spindle up to 42 KW and 24 000 rpm
- Up to 5 CRENO Ultrasonic heads
- CRENO know how and software solutions for programming

Upgrading of your machine with the CRENO ultrasonic cutting function

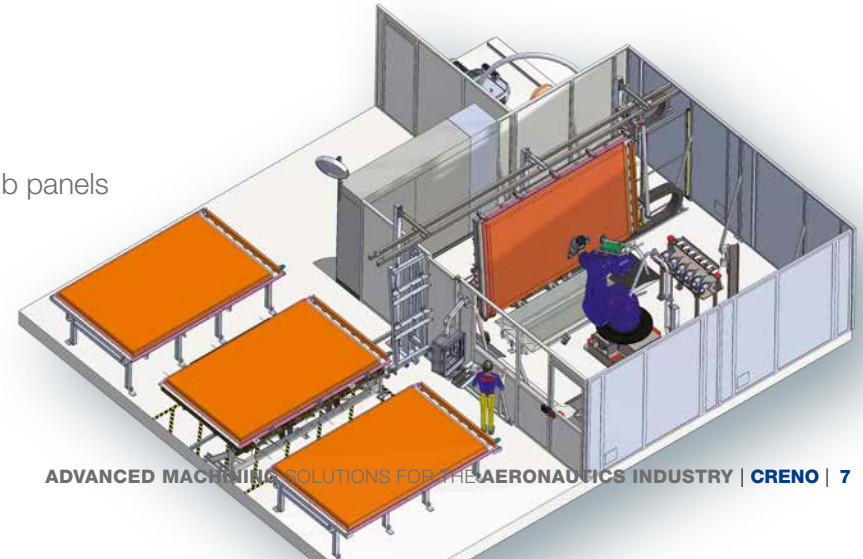
CRENO can provide a full Ultrasonic kit which included :

- Generator and CRENO ultrasonic heads
- Automatic interface for your spindle
- Tool changer adaptation
- Software and programming training

Available for all Brands of machine

Robot cell

- Standard robot cell dedicated to honeycomb panels
- Table 3m (9.9 ft) x 2m (6.6 ft)
- Siemens 840 D SL NC
- Milling spindle 3,5 KW - 24 000 rpm
- 4 ultrasonic heads milling tools
- 3 tables for easy loading & unloading



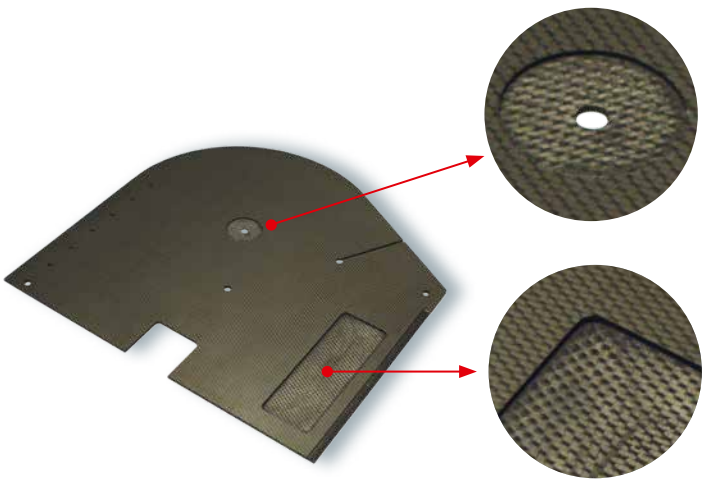
Machining of Composite Parts

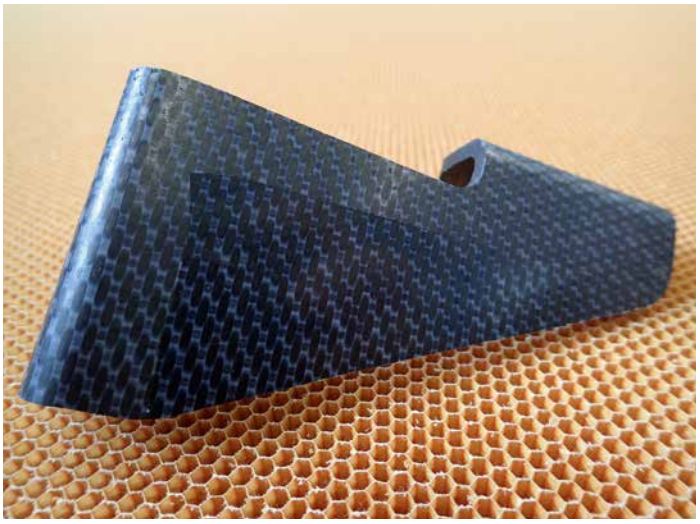
CRENO is known worldwide to have delivered numerous large-sized, **customized gantry CNC 3 / 5 axis milling machines** dedicated **to composite milling.** Since 2015, we have extended our range for milling composite parts and materials with robotic machining and robot cell solutions.

CRENO Solutions

Designed for

- High Accuracy
- Strong Rellability
- More Efficiency
- Robust design and reliability
- Environment Protection
- Various end effector technologies = Counter sink device, orbital drilling, compliance milling





CRENO CNC Milling

5-Axis Machine

High accuracy and strong reliability, heavy duty, customized, advanced machining solutions.

▶ A full range of multi-axis machines

Satellite panel machining

Overhead moving gantry

Shuttles

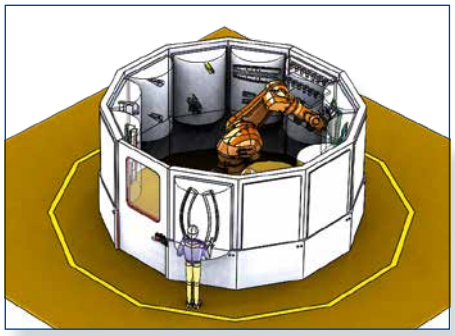
- X axis travel up to 20m (66 ft), Y axis up to 9m (30 ft), Z axis up to 2.5m (8.2 ft)
- Spindle power up to 42kW

A full range of high-tech equipment: Countersinking, Orbital drilling, Compliance milling, Machining aggregates, Probes, Laser tool management…

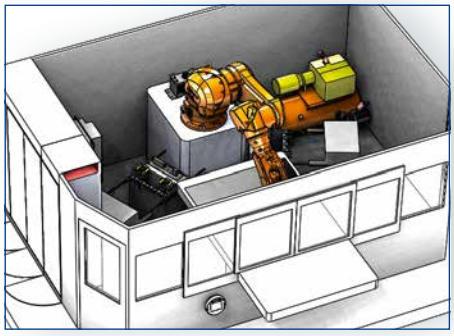
CRENO CNC Milling

Robot cell

▶ A full range of robotic machining cell solutions



Multi-placement robot cell
for more productivity

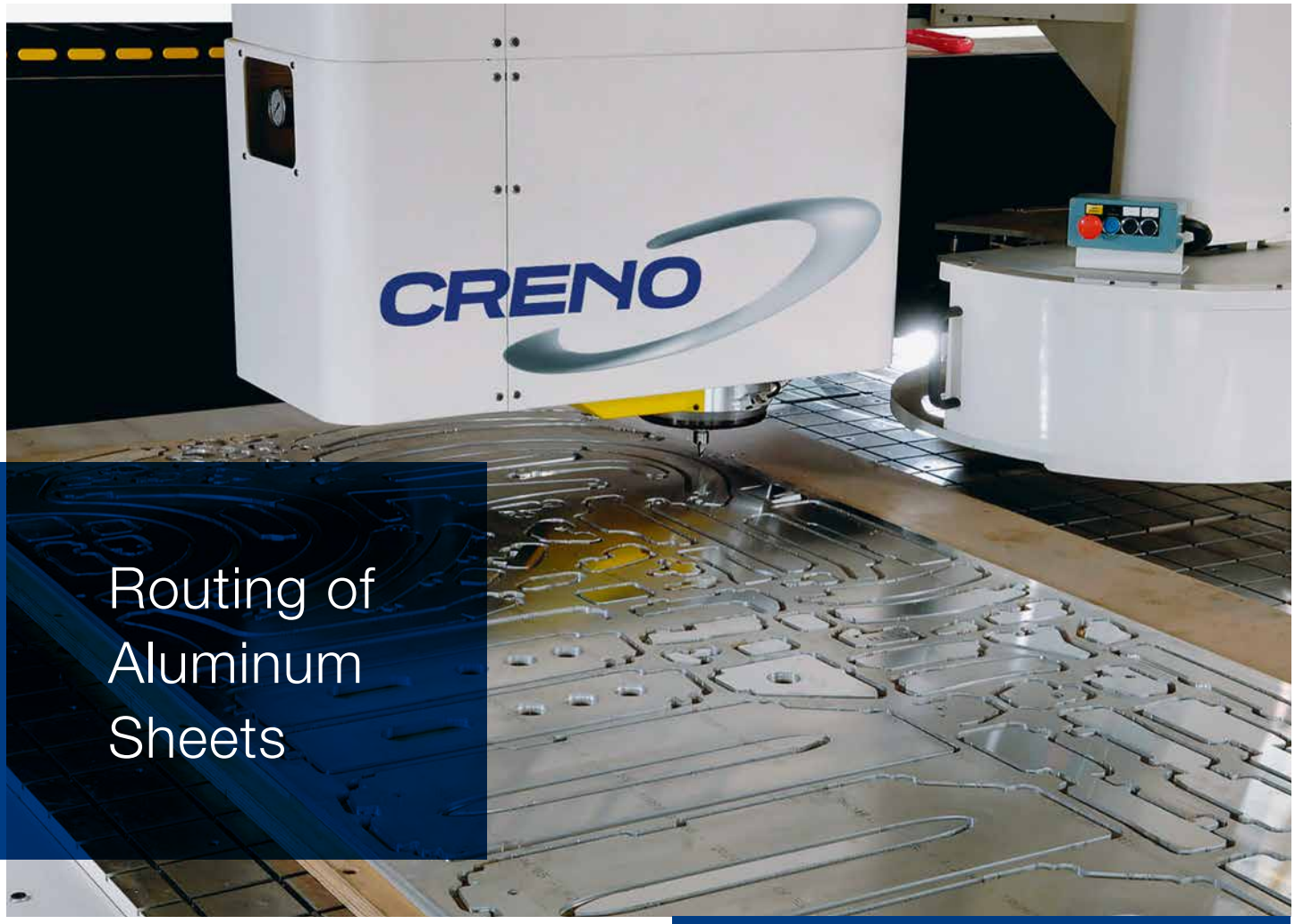


Pendular robot cell
for more flexibility

These solutions can be used in all industries likely to use robotic machining of composite materials.

Advantages of machining composite material on robots:

- High productivity, in particular due to the pooling of tools and multiple installation options
- Loading and unloading during machining operations
- Better access to machining areas



Routing of Aluminum Sheets

Creator of the “bridge-cut” process, CRENO aluminum stack routers automate the sheet trimming process with a very high level of productivity and quality.

This solution offers:

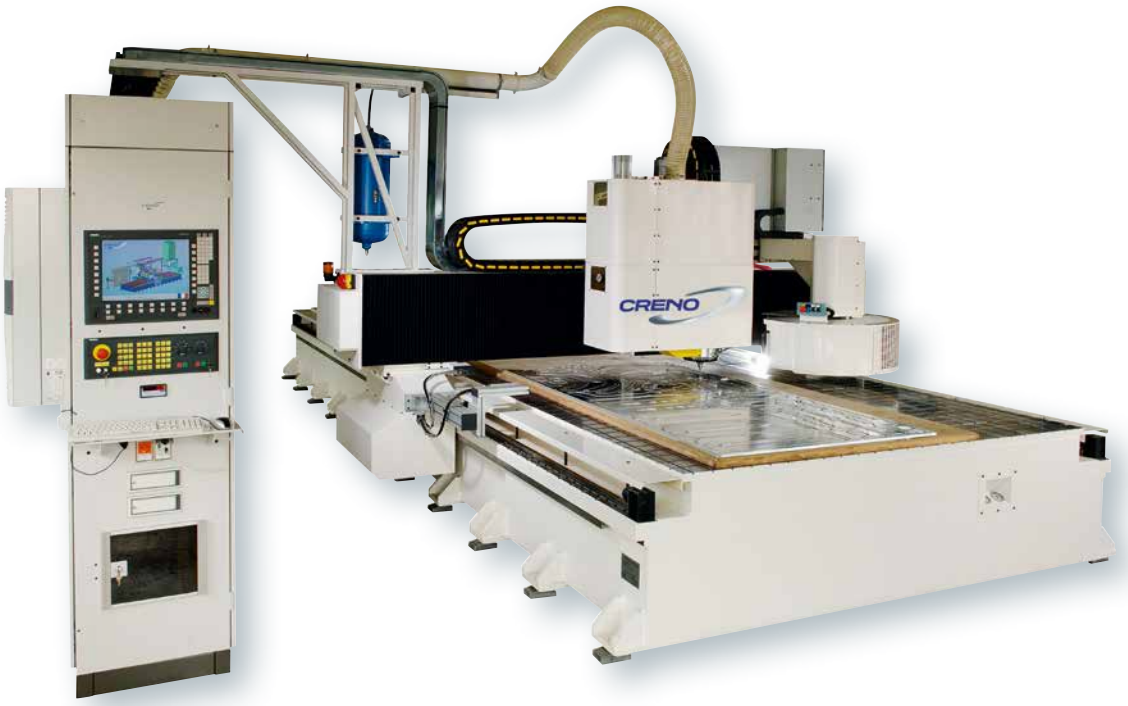
- Complete supervision of the process for each machining sequence
- Multiple aluminum sheets up to 12mm (0.47 inch)
- Single steel sheets up to 2.5mm (0.01 inch)
- Three metal machining operations: trimming, drilling, surfacing
- Part marking system

The aluminum stack router solution

From your 2D CAD files, the machine generates the optimal nesting in order to minimize waste. Metal Trimming and drilling operations are automatically and simultaneously performed on sheet stacks of up to 12mm (0.47in).

The automatic tool changer, the efficient dust extraction system, and the “Bridge-cut” system offer fully automated operations.

Stack Router Machine “Bridge cut”



STANDARD TECHNICAL DATA

Axis strokes

Moving table

y 1 500mm (5 ft)

z 300mm (1 ft)

x 3 700mm (12 ft)

Gantry

y 2000mm to 2 600mm (6.6 to 8.5 ft)

z 300mm (1 ft)

x 4 000mm to 12 000mm (13 to 40 ft)

Axis speed

y 25m/min (1 000 inch/min)

z 20m/min (790 inch/min)

x 25m/min (1 000 inch/min)

Spindle

20 kW
Power

24 000 rpm
Speed

HSK E50
Taper

Tool changer

16
Storage positions
up to 60 as an option

Tool length
up to 150 mm (6 inch)

50 mm (2 inch)
Maximum tool diameter

Material

- Aluminum multi sheet up to 12mm (0.47 inch)
- Steel in single sheet up to 2.5mm (0.01 inch)

Local Application Centers in Europe and USA

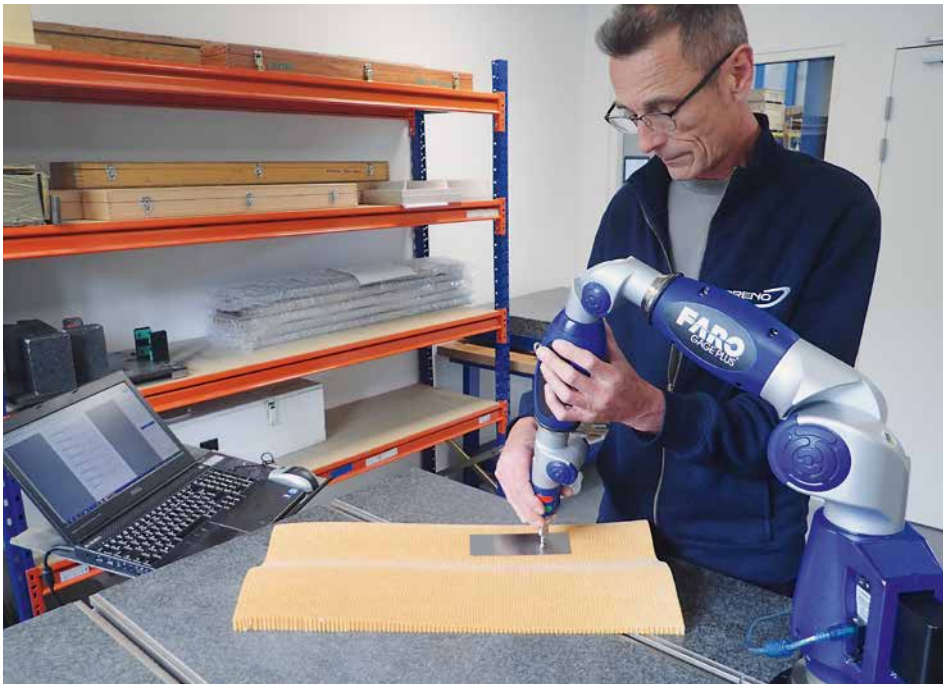
One Team Working for You

- Engineering Team **dedicated for customer studies** with strong experience in programming and machining
- **Supporting** you to take the **full advantage of ultrasonic cutting**
- **Developing and programming** with last generation of CAD, CFAO and simulation software
- **Operator and Programmer Training:** learn how to use the advantages of ultrasonic cutting, how to optimize multi-drilling to fully exploit the potential of CRENO Processes

Highly Performing Machines Park

- **Large capacity robot cell with rotative table** able to perform several machining processes through end-effectors:
  - Ultrasonic Cutting
  - Multi-Drilling
  - Machining
- **Temperature stability metrology room** allowing us to warranty the quality of the process and qualification of your parts
- **A confidential area** to secure your development project and respect your privacy

Qualification of **your future products** & **processes**



Assisting you in the very early stages of your project

- **Validate** the feasibility of your project
- **Make** your prototype parts
- **Build** your demonstrator
- **Manufacture first parts** on production equipment
- **Develop** the machining strategy for new materials/shapes
- **Improve** your environmental and safety issue with innovative machining processes

Development of **new technologies**

Because innovation is your driving force...

You can rely on a dedicated highly skilled CRENO team to work on each of your projects:

- **Create** new specific machining technologies to improve your performance
- **Develop** your future innovative equipment in partnership with your team

Production and **Maintenance Support**

↗ CRENO services allows you to obtain a quality, efficient and customized support. Our main objective is to enable you to get the best of your CRENO CNC machines and robot cells.

Best-in-class customer services and **support**

- **Hotline and help**
- **Spare parts**
- **Preventive maintenance**
- **Components repairs**
- **Refurbishing**
- **Training & process improvement**

CRENO Services

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The most prestigious names in the industry rely on us

Every day,
our goal is to maintain their trust and earn yours.

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We would be pleased to welcome you in our head office located in Annecy, in the heart of the French Alps.

Worldwide presence

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The CRENO team never sleeps. We are at your service, whatever your time zone, wherever you are in the world.

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