



Automation solutions for complex composites

SAMBA & ARTIST STUDIO | Fiber Patch Placement by Cevotec

May 2023

cevotec
milestones in composites

Cevotec – Fiber Patch Placement equipment & software

Founded in 2015, Cevotec has become the globally leading technology partner for automated lay-up processes based on Fiber Patch Placement (FPP) technology.

- Located in Unterhaching near Munich, Germany
- High-tech development lab & facilities
- Founded 2015 by current CEO Thorsten Groene together with composite experts Felix Michl, Dr. Neven Majic and Prof. Klaus Drechsler
- Since 2021, backed by and partnered with customized machine builder GFM (Austria)
- As of 2023, 25 employees & growing
- Local sales partners in France, North America, Japan and China



Our mission:

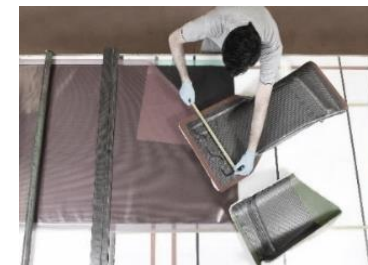
Enabling manufacturers to produce complex composites in high volume and superior quality!

Challenge: Complex composites still greatly manufactured by hand

Need for automation solutions to meet future production demand.



- Long production cycles
- No effective quality control
- High scrap rates (>30%)
- High cost



Solution: Fiber Patch Placement

Additive 3D fiber lay-up technology for complex composites.

Benefits



Digitized, automated process chain



100% in-process raw material control



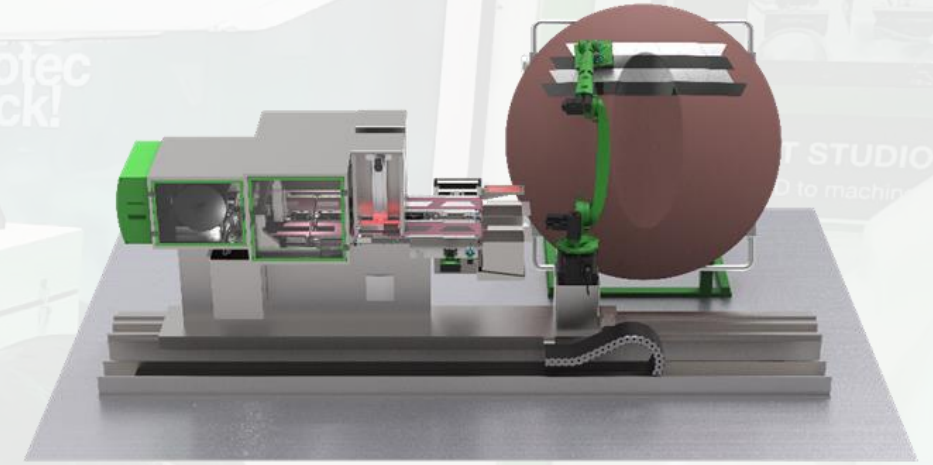
Multi-material lay-up capability



20% - 60% cost & time savings

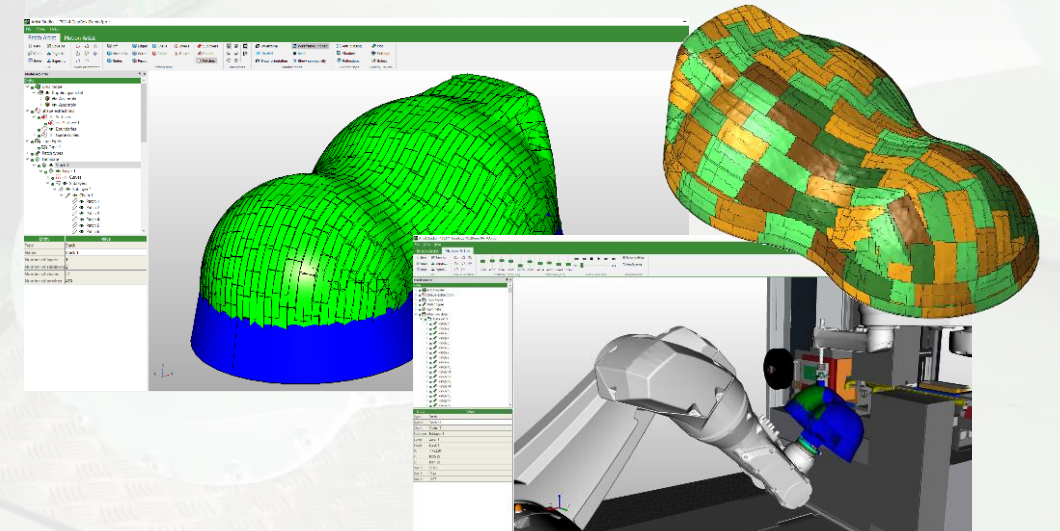
SAMBA Series

3D fiber lay-up automation platform



ARTIST STUDIO

CAE software for design & production



[Watch on YouTube how FPP works!](#)

Focus industries

Automated lay-up for complex composites with Fiber Patch Placement.

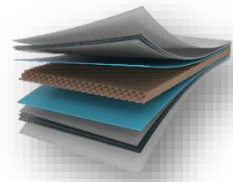


• Aerospace

Automation for complex, multi-material composites



Multi-material
composites



Complex
geometries



Tailored
reinforcements



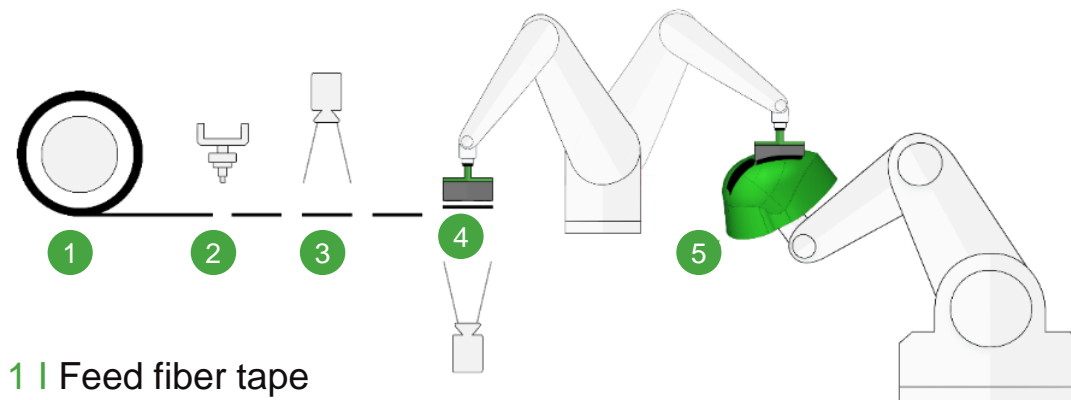
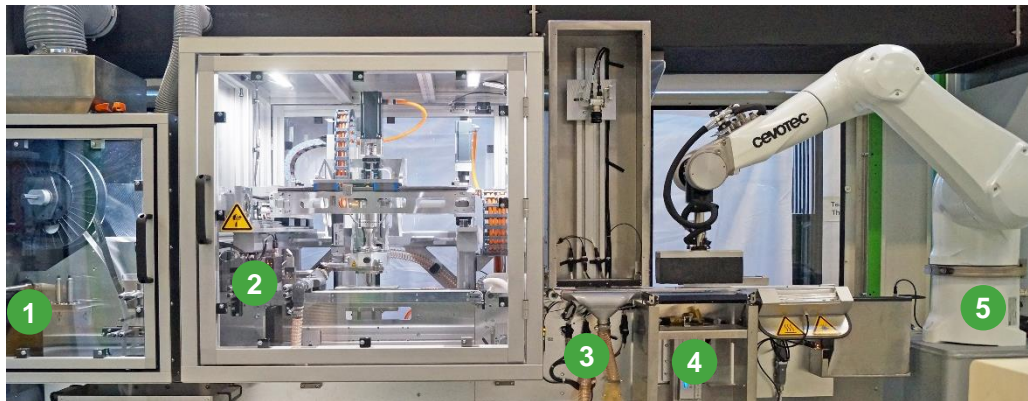
• Composite tanks

Improving storage efficiency of hydrogen composite tanks with FPP

The Fiber Patch Placement technology

Flexible lay-up technology for complex high-performance composites enabling a fully automated, quality-controlled 3D lay-up.

Process overview



1 | Feed fiber tape

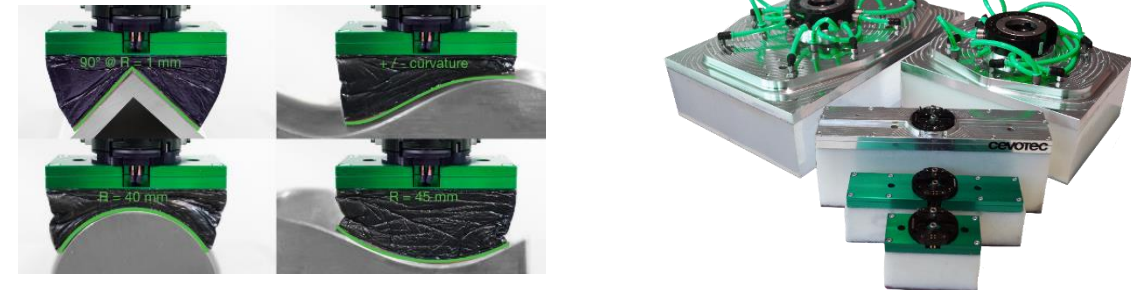
2 | Cut tape into patches

3 | Inspect quality

4 | Pick-up, check position

5 | Place fiber patch

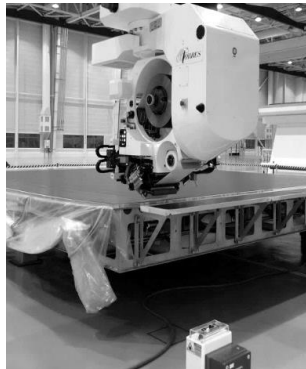
Gripper technology for lay-up on complex shapes



- Controlled fiber deposition on concave & convex surfaces
- Placement directly onto honeycomb cores
- Equipped with compaction-force sensor
- Multiple sizes up to 300 mm x 200 mm
- Suitable for multi-material placement: e.g. adhesives, glass, carbon, etc.

Technology uniquely positioned to extend composites' automation envelope

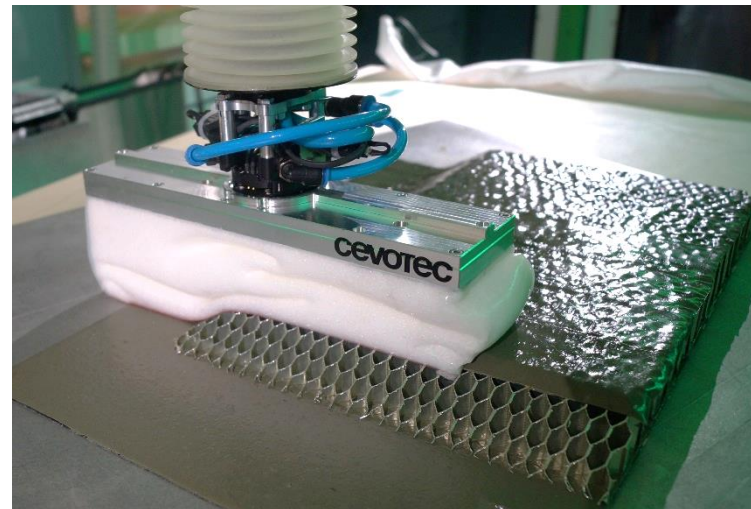
Fiber Patch Placement technology enables the fully automated lay-up of complex-shaped parts and is compatible with a broad variety of materials.



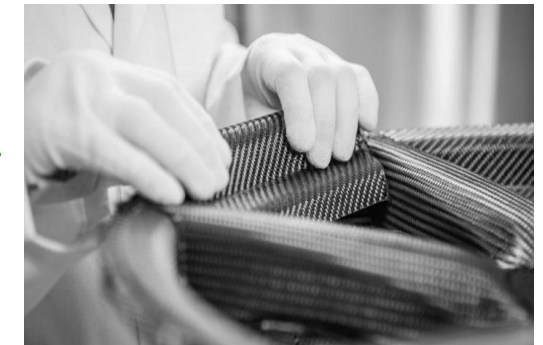
Automated
Tape Laying



Automated
Fiber Placement

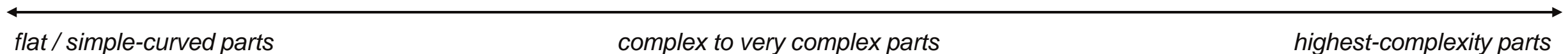


Cevotec's
Automated Fiber Patch Placement



Hand layup and other
unoptimized processes

extending capabilities as technology develops

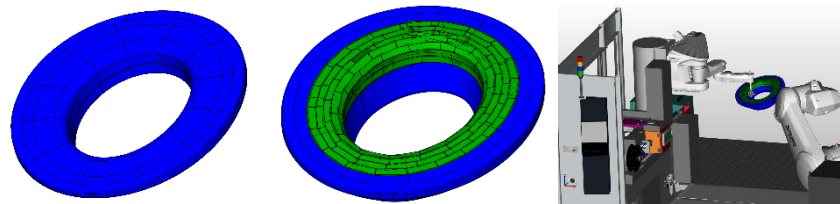
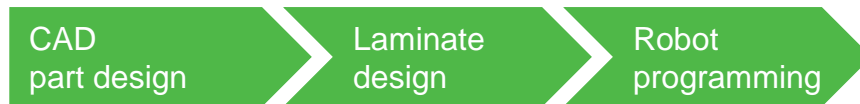


Significantly shortened process for complex composite lay-ups

Working with standardized fiber tape cuts process time & cost by 20-60% – no nesting, cutting and kitting required.

Development phase

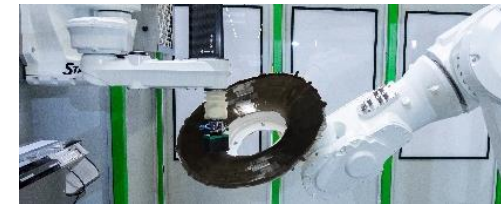
Fiber Patch Placement



ARTIST STUDIO

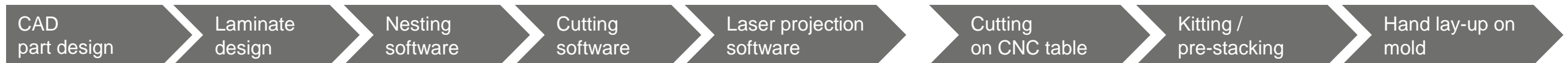
Recurring production

Fully automated
3D lay-up on mold



SAMBA FPP system

Conventional process



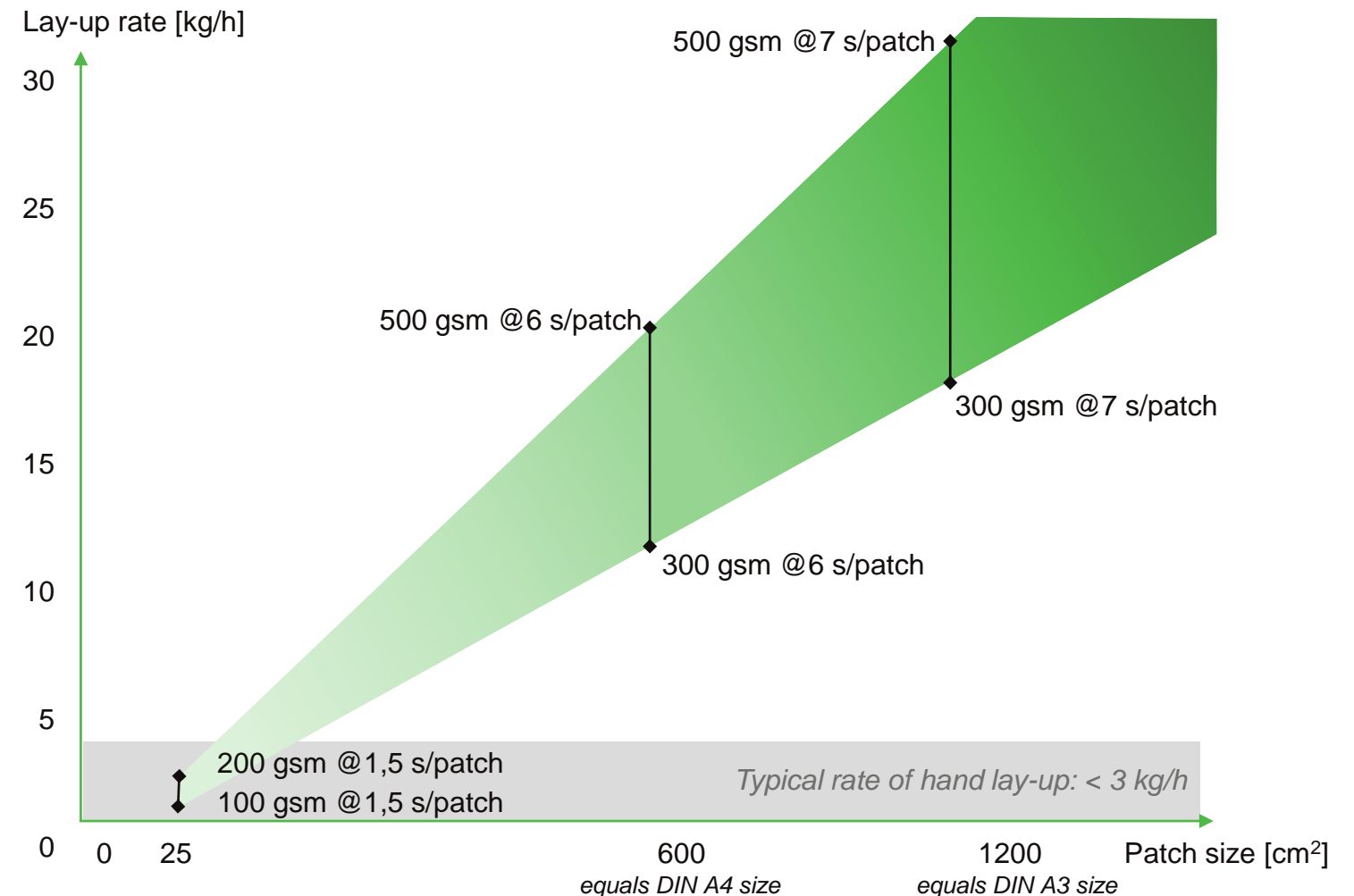
Productivity of FFP lay-up systems

Effective lay-up rates result from process parameters and can be customized to applications.

Lay-up rate:

$$\dot{m} = \frac{\text{patch length} * \text{patch width} * \text{areal weight} * \text{no.robots}}{\text{patch cycle time}}$$

- SAMBA Series systems are equipped with placement robots and mold manipulators that best fit your application
- For high throughput requirements, two or more placement robots can be fed by one feeding unit.
- The graph illustrates achievable lay-up rates based on different SAMBA Series configurations.

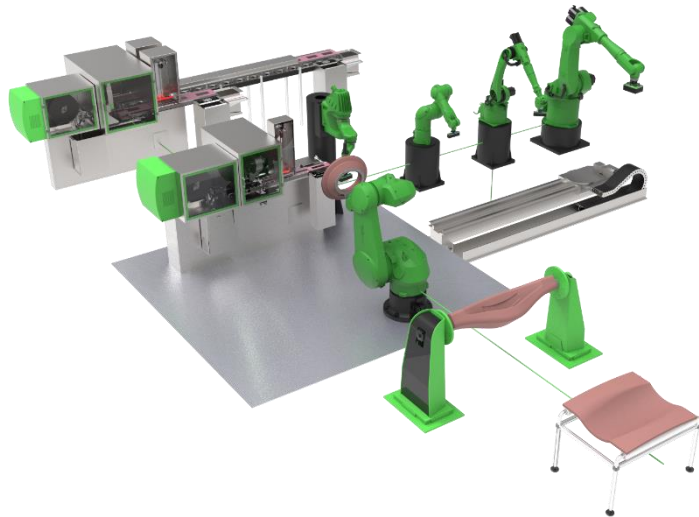


The Cevotec portfolio

Specialists in patch-based production equipment & software for automation solutions.

SAMBA Series

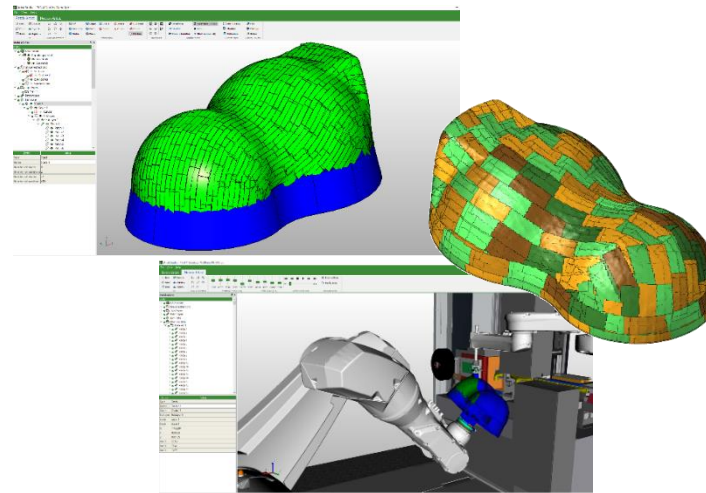
FPP automation platform



- Flexible 3D fiber lay-up platforms
- Configurations tailored to applications
- 20% - 60% cost & time reduction
- Maintenance & engineering services

ARTIST STUDIO

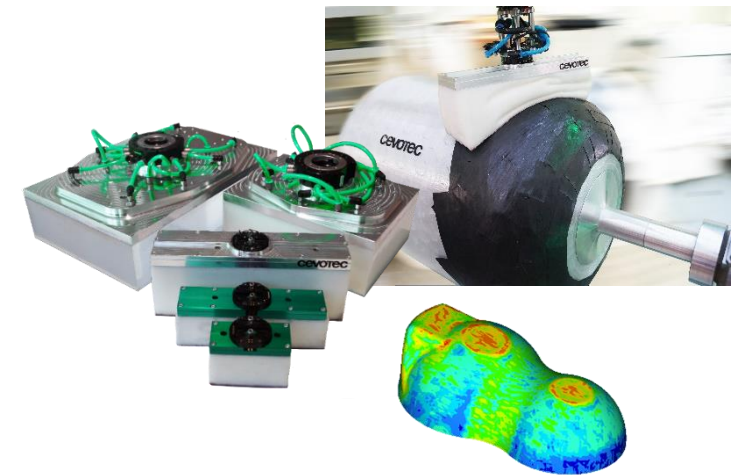
CAE software platform



- CAD-CAM for patch technology
- Automated programming of SAMBA systems
- Interface module for FE software available
- Training and consulting for engineering teams

cevoLab

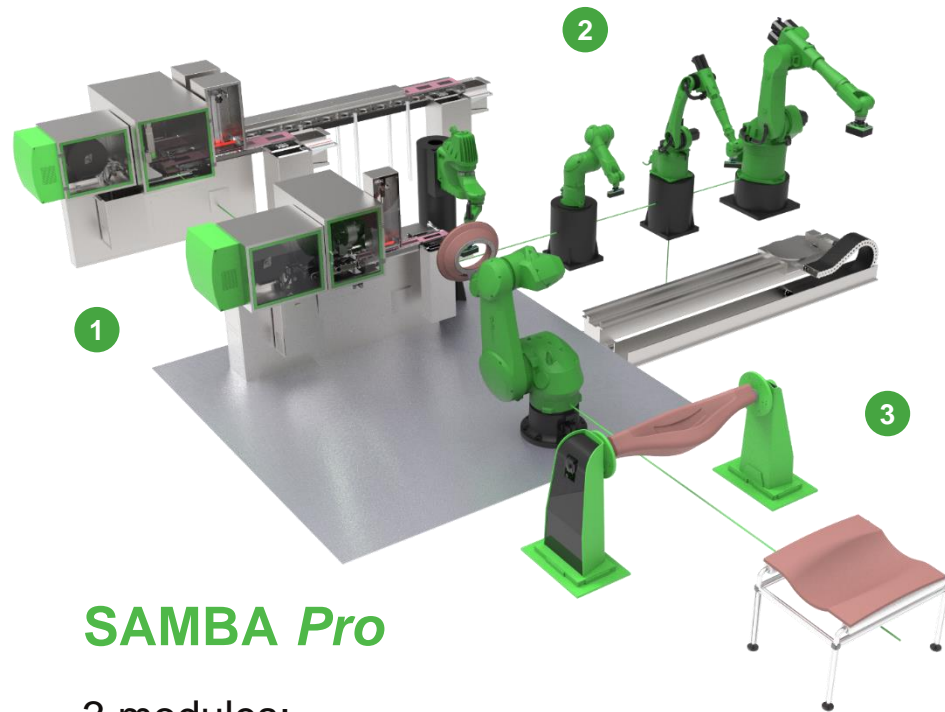
FPP Competence Center



- Application & process development
- Customization of equipment
- Prototyping & low-volume production service
- CAE analysis & FEM-based optimization

SAMBA Series: Fiber Patch Placement automation platform

Scalable and flexible technology for multiple applications.



SAMBA Pro

3 modules:

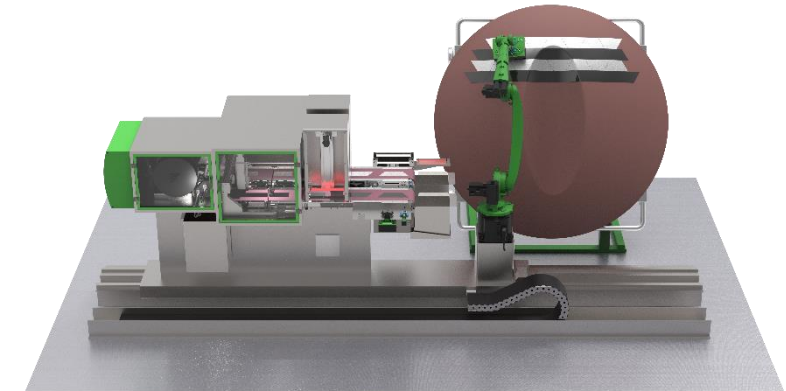
1. Automated material feeding & cutting
2. Placement units
3. Tool holders and manipulators



[Watch our video about SAMBA!](#)

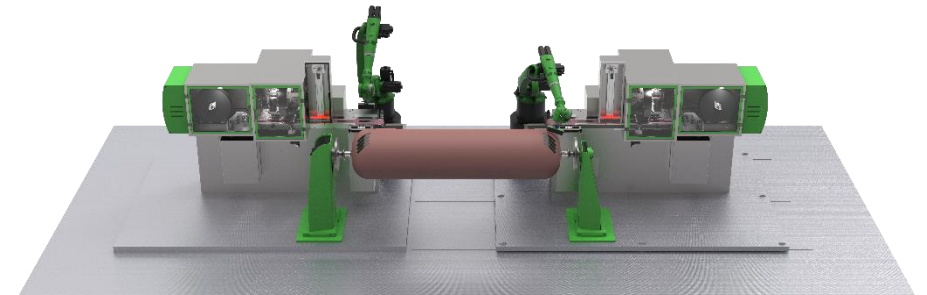
SAMBA Pro Multi

Sample configuration for aerospace



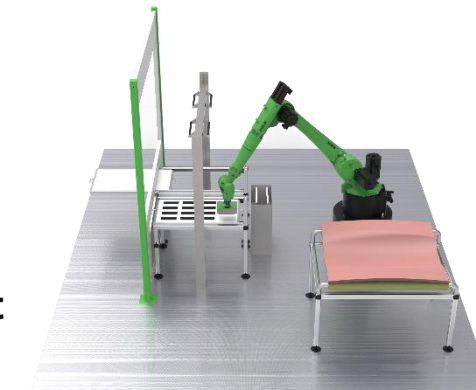
SAMBA Pro PV-1

Sample configuration for composite tanks



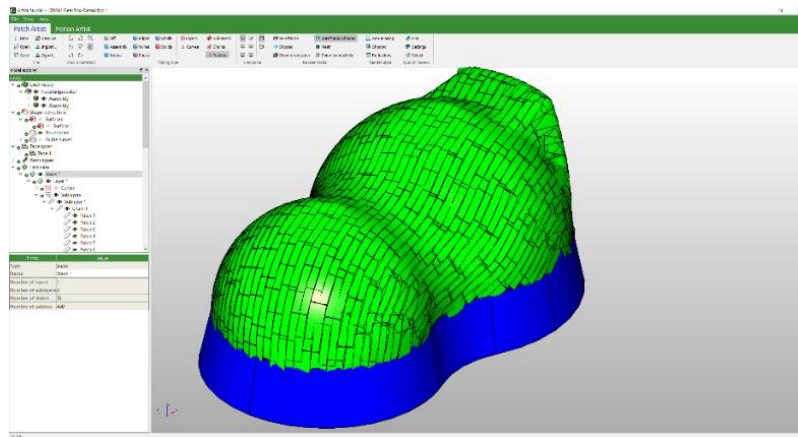
SAMBA Step

Sample configuration for research & development



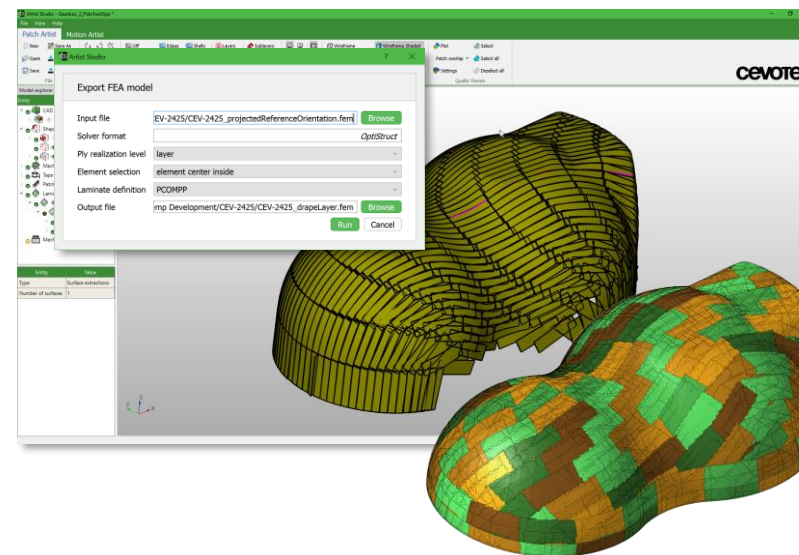
ARTIST STUDIO: CAE software platform

Advanced CAD-CAM software incl. interface module for FEA software to enable comprehensive digital product and process development.



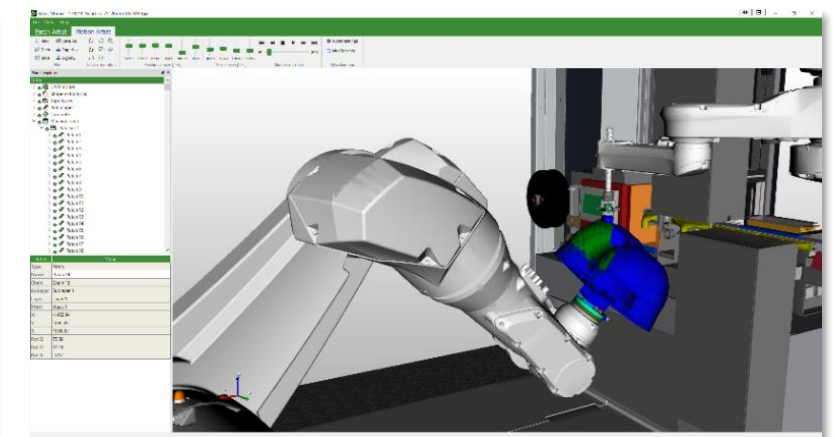
CAD – Patch Artist

- Generating optimized patch laminates
- Automated patch creation on guide curves
- Unique & efficient FPP-specific design features



FE-module

- Connecting FPP laminates with FE meshes for structural analysis
- Automated modeling of patches, fiber orientation, thickness, patch overlaps



CAM – Motion Artist

- Generating SAMBA machine data through fully automated offline robot programming
- Robot movements with consideration of axis limits, robot range, singularities, collision detection



cevoLab: The Fiber Patch Placement Competence Center

Cevotec's own high-tech lab optimally supports application and process developments, prototyping and small series production.

Range of services

- Virtual design and studies, e.g. FPP laminate design, FE-based simulation, unit cost analysis
- Prototyping with FPP: material testing, proof of concept, full-scale demonstrators, etc.
- FPP-as-a-service: production of small batches of series products
- Process development and customization of equipment

Available equipment

- **SAMBA Pro** system (Generation 1)
 - Stäubli TP80 scara placement robot and TX 200 6-axis tool manipulator
 - Laser cutting of tape material; processible tape width 12.5 – 50 mm
 - Part size envelope: ~ 1m³ built volume, max. tool weight: ~ 100 kg
- **SAMBA Step L** system
 - Large Kuka KR 60-3 placement robot mounted on KUKA linear rail; flexible space for customer tool
 - Material feeding table for patches up to ~200 x 300 m²
 - Part size envelope (LxWxH): ~ 2 x 3 x 2 m³
- **Software** stack:
 - CAD: Autodesk Inventor, ARTIST STUDIO | FEM: Altair Hyperworks | CAM: ARTIST STUDIO

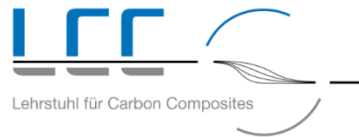


[Watch SAMBA in Rolling Motion!](#)

Partners & references

Premier OEM, manufacturers and institutes develop innovative automation solutions with us.

References (selection)



The Boeing Company

Mercedes Benz AG

Strategic partners

Strong partners share our vision, support us and work jointly with us towards a better future!

AIRBUS



International sales partners

North America:

Composite Automation

<http://www.compositeautomation.com>

John Melilli: john@compositeautomation.com

Japan & Thailand:

Fuji Industries Co. Ltd.

<http://www.ficjp.com/en/>

Noriyuki Ueno: n.ueno@ficjpn.co.jp

China:

Hesse, André & Co. (GmbH & Co.) KG

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ChunHua Automotive Technology Co., Ltd.

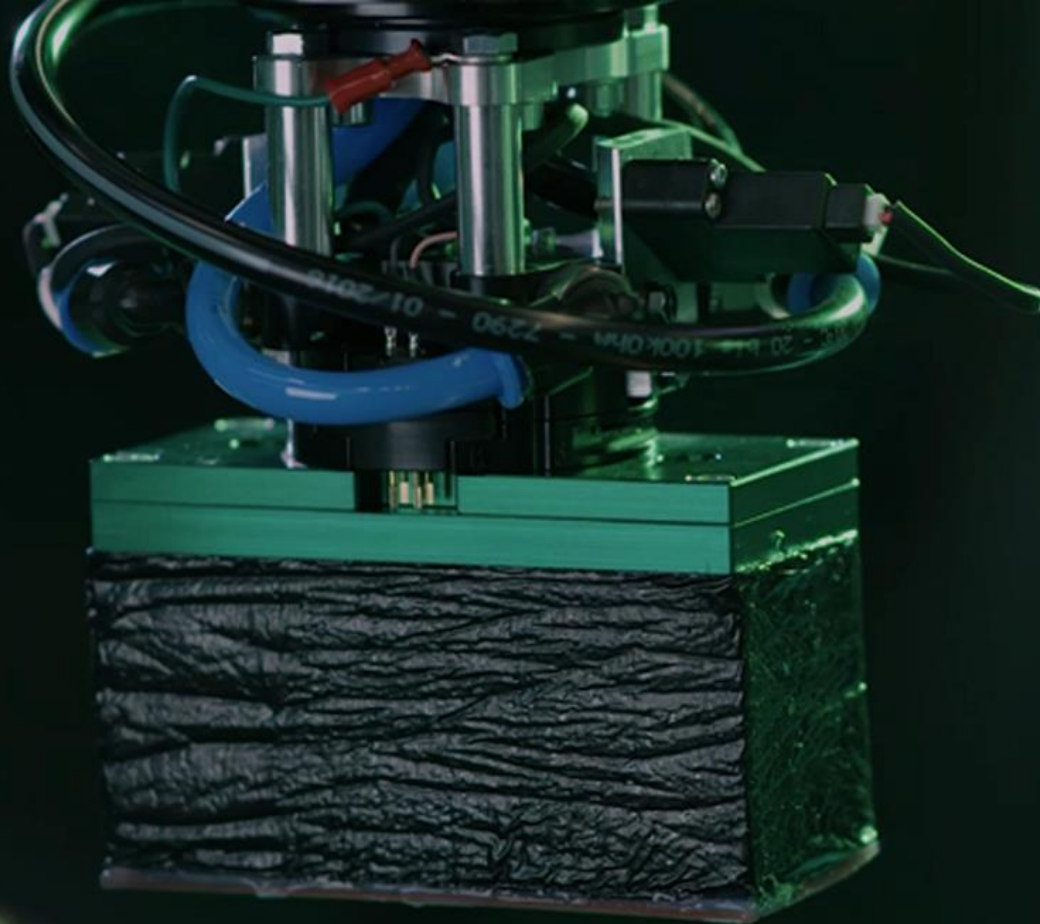
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milestones in composites

How to get started with Fiber Patch Placement?

Step 1: ROI & suitability assessment

Includes manufacturability assessment, unit cost & time analysis, benefits & ROI estimation. This service is complimentary for you.

→ **How much does your application benefit from FPP?**

Step 2: Joint application development

Includes virtual studies, application and demonstrator development, equipment customization, and more.

→ **How do you best develop & test your FPP application?**

Step 3: Customized lay-up equipment

Includes SAMBA lay-up systems, ARTIST STUDIO software, customized patch grippers, quality control systems, and more.

→ **Which system configuration is best for your application?**

Get started with

Fiber Patch Placement

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We enable manufacturers to produce complex composites in high volume and superior quality.
For a lighter, more sustainable future.