
# Automation solutions for complex composites

SAMBA & ARTIST STUDIO | Fiber Patch Placement by Cevotec

October 2022

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 2022, 20 employees & growing
- Local sales partners in North America and Japan

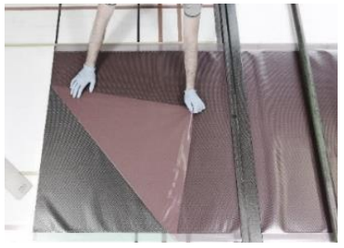

**Our mission:**

**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

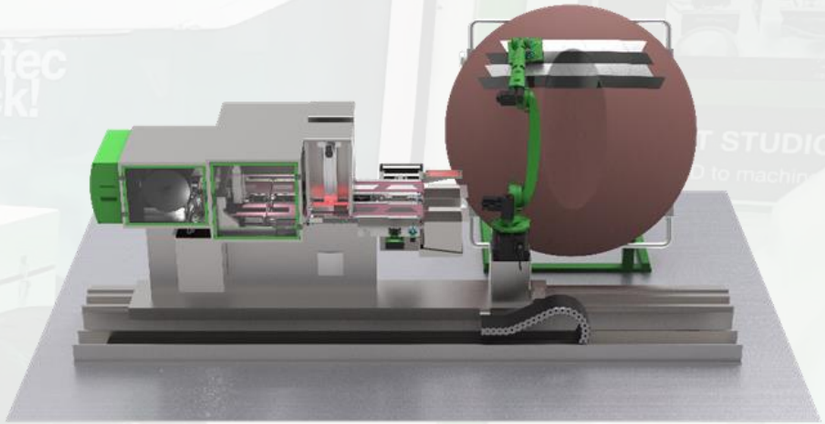


# Solution: Fiber Patch Placement

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

## SAMBA *Series*

3D fiber lay-up automation platform

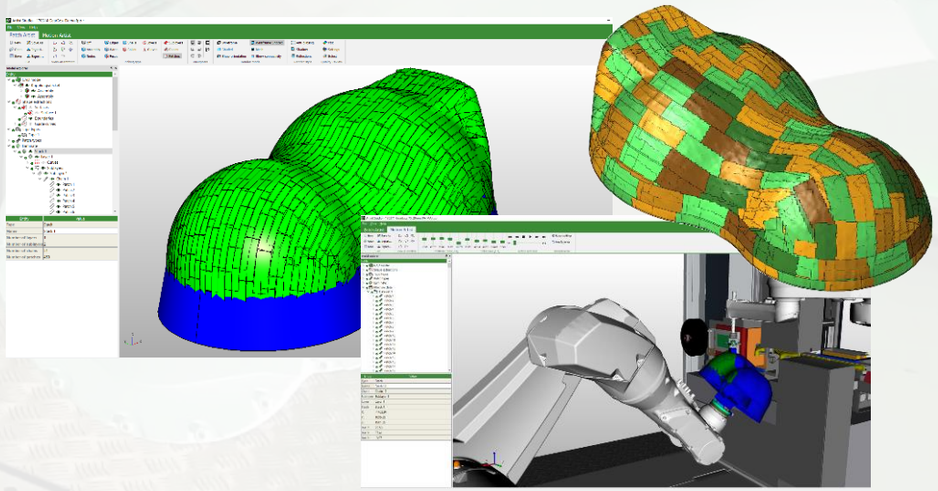


## Benefits

- Digitized, automated process chain
- 100% in-process raw material control
- Multi-material lay-up capability
- 20% - 60% cost & time savings

## ARTIST STUDIO

CAE software for design & production



Watch on YouTube how FPP works!

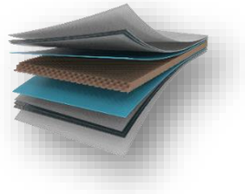
# Focus industries

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

## Aerospace

Automation for complex, multi-material composites

Multi-material composites



Complex geometries

Tailored reinforcements

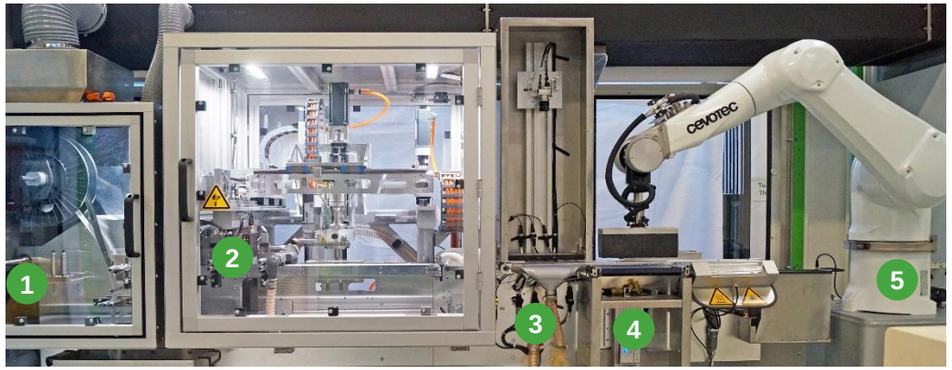

## Composite tanks

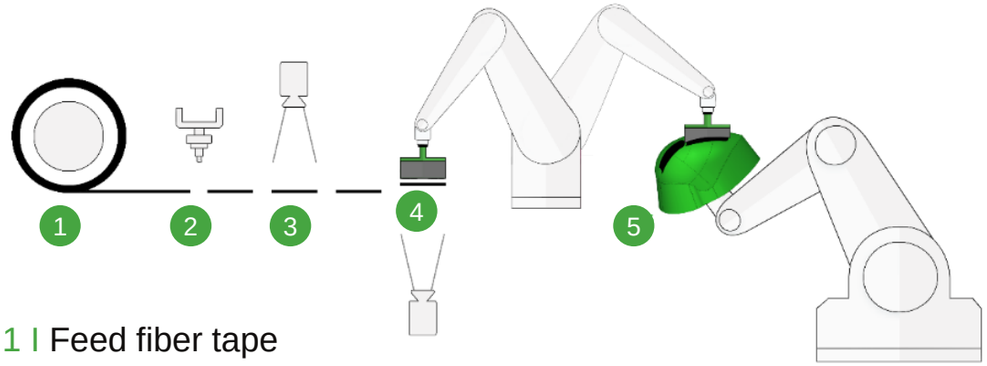
Improving storage efficiency of hydrogen composite tanks with FPP

# 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 I Feed fiber tape

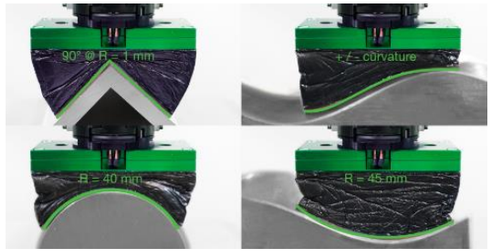
2 I Cut tape into patches

3 I Inspect quality

4 I Pick-up, check position

5 I Place fiber patch

## Gripper technology for lay-up on complex shapes

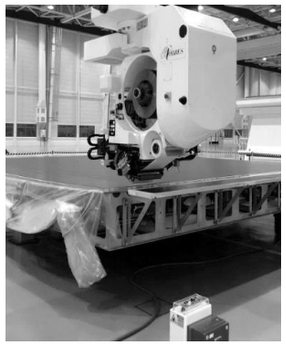




- Controlled fiber deposition on concave & convex surfaces
- Placement directly onto honeycomb cores
- Equipped with compaction-force sensor
- Multiple sizes up to 300 mm x 200 mm
- Suitable for multi-material placement: e.g. adhesives, glass, carbon, etc.

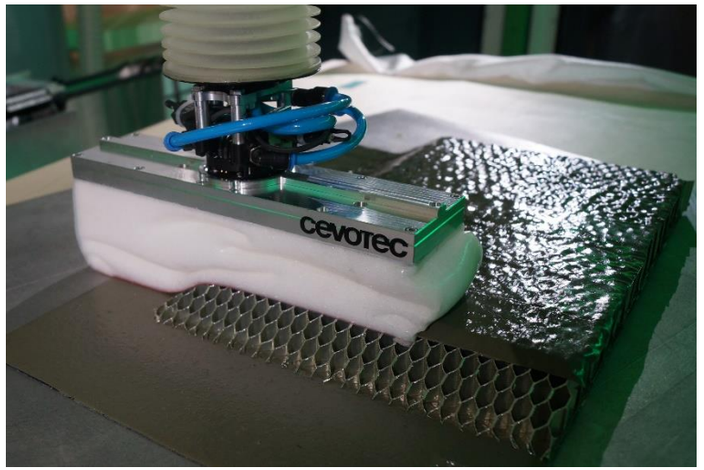
# Technology uniquely positioned to extend composites' automation envelope

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**

*flat / simple-curved parts* — *complex to very complex parts* — *highest-complexity parts*

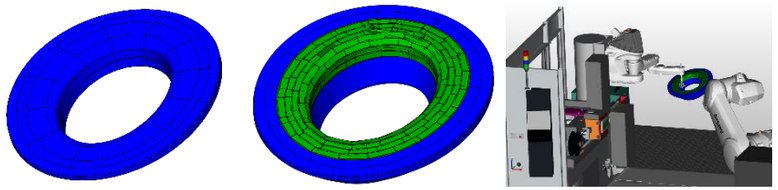
# Significantly shortened process for complex composite lay-ups

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

## Development phase

### Fiber Patch Placement

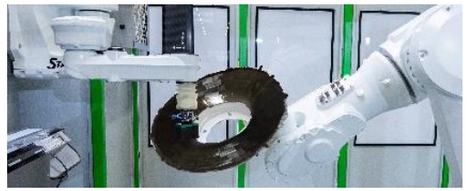
CAD part design → Laminate design → Robot programming



**ARTIST STUDIO**

## Recurring production

Fully automated 3D lay-up on mold



**SAMBA FPP sytem**

## Conventional process

CAD part design → Laminate design → Nesting software → Cutting software → Laser projection software → Cutting on CNC table → Kitting / pre-stacking → Hand lay-up on mold

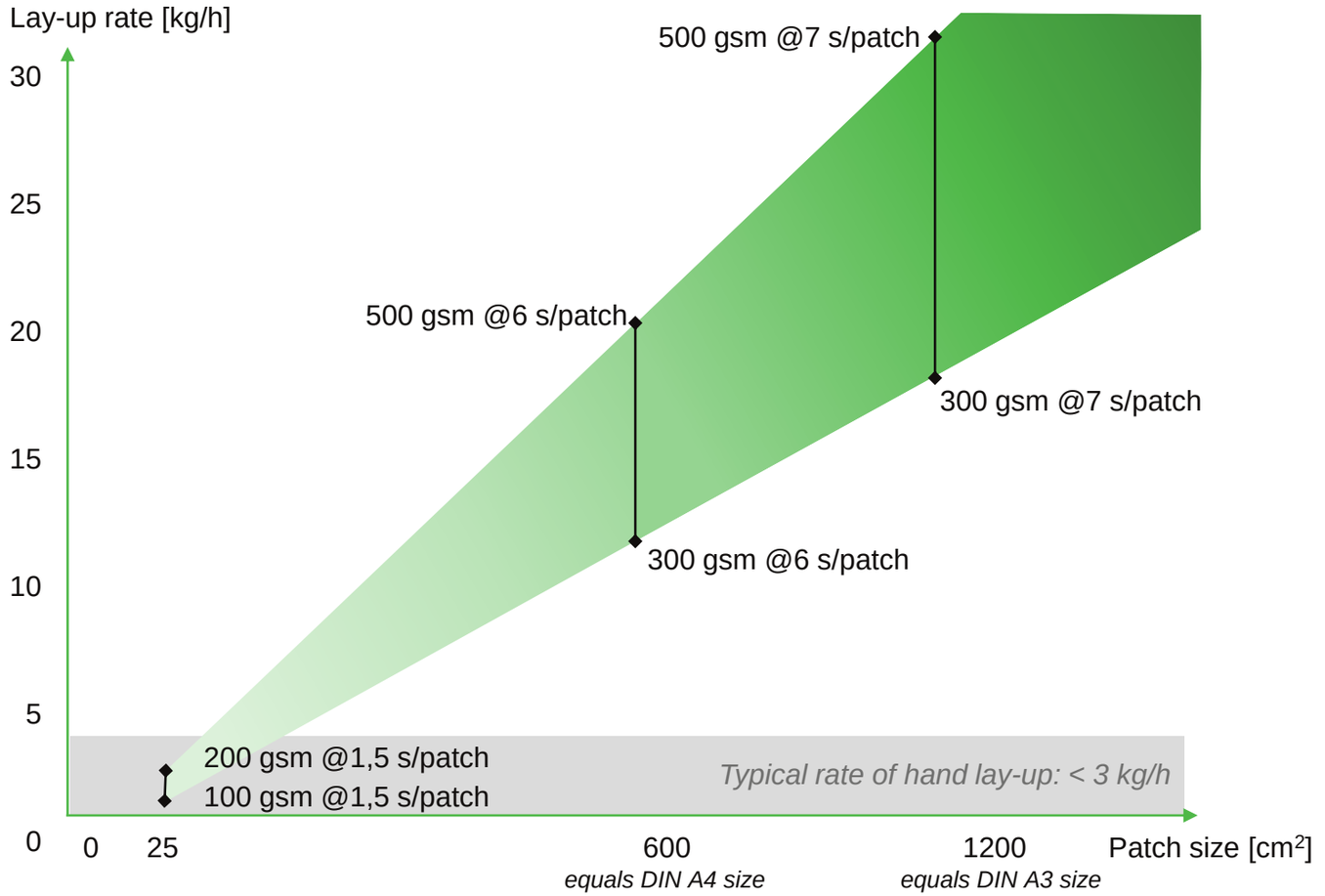
# Productivity of FPP lay-up systems

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

**Lay-up rate:**

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

- 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.

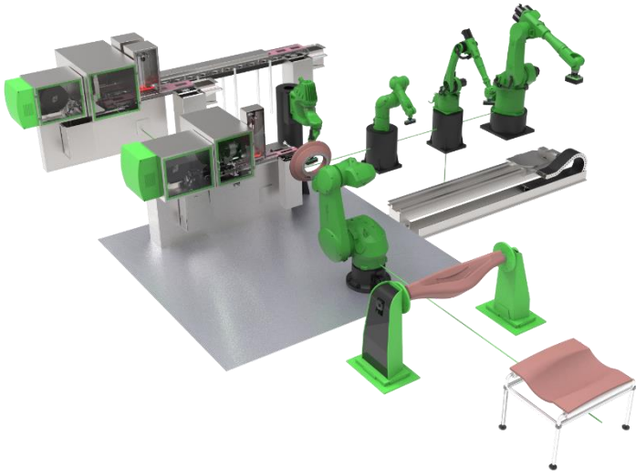



# The Cevotec portfolio

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

## **SAMBA** *Series*

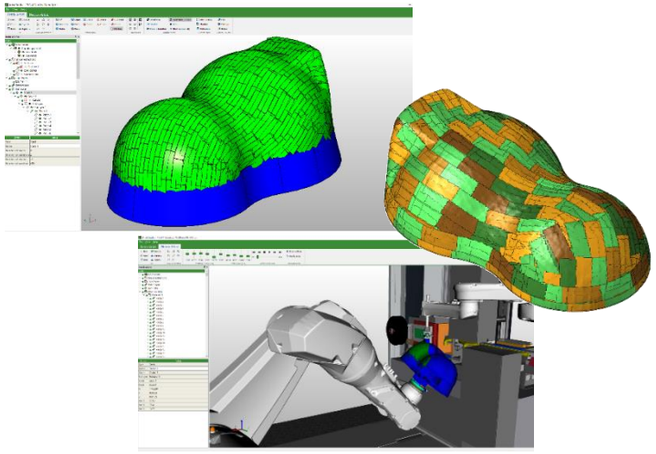
FPP automation platform



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

## **ARTIST STUDIO**

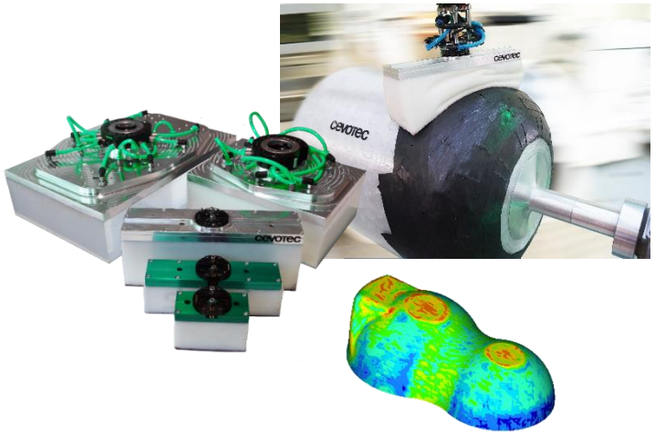
CAE software platform



- 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*

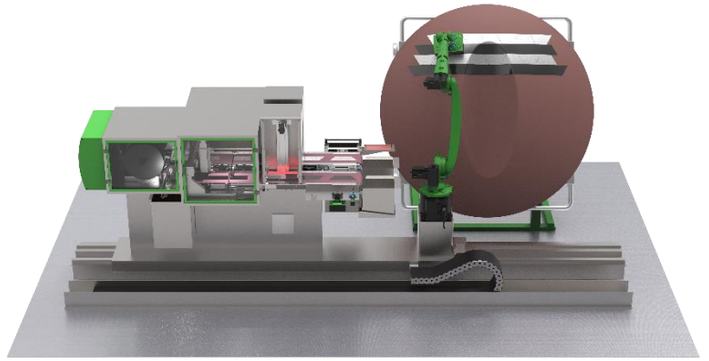
3 modules:

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

Watch our video about SAMBA!

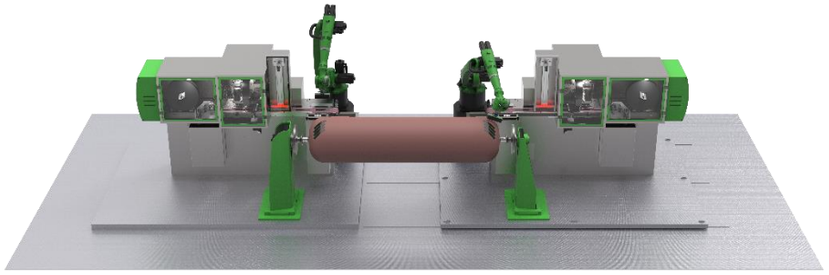
### SAMBA *Pro Multi*

Sample configuration for **aerospace**



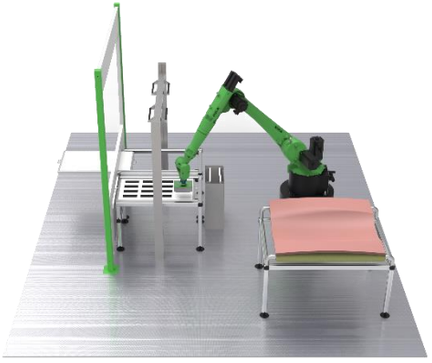
### SAMBA *Pro PV-1*

Sample configuration for **composite tanks**



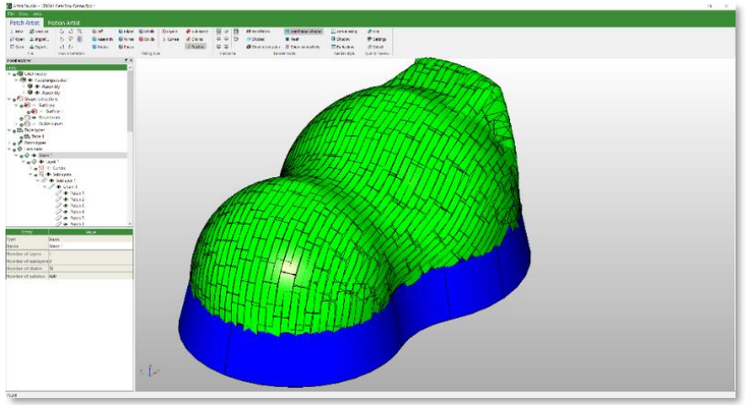
### SAMBA *Step*

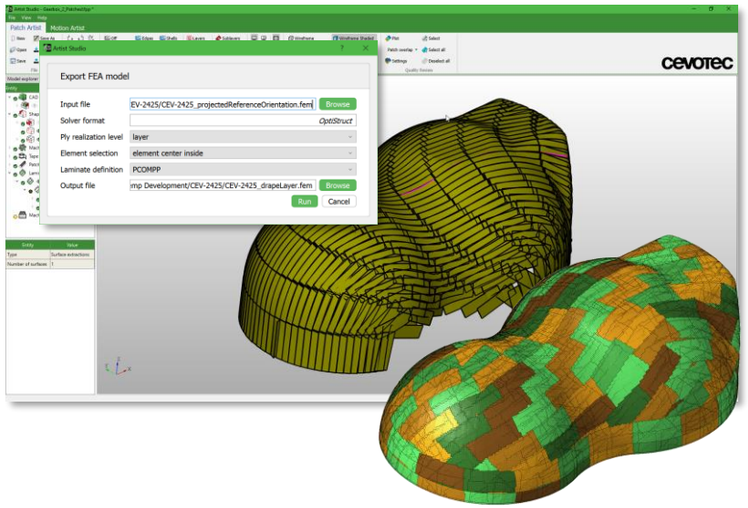
Sample configuration for **research & development**

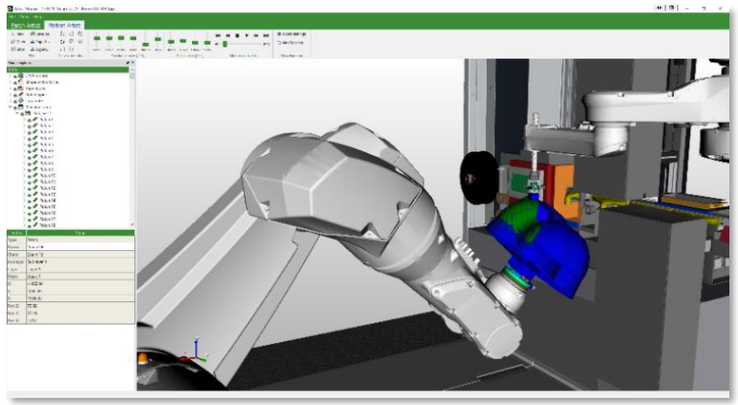


# ARTIST STUDIO: CAE software platform

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

Watch our video about ARTIST STUDO!

# 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

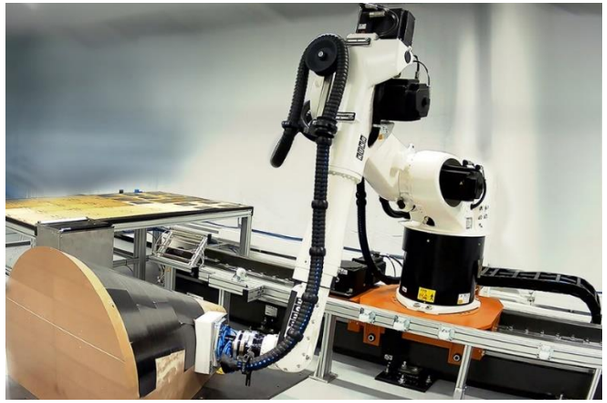
· Prototyping with FPP: material testing, proof of concept, full-scale demonstrators, etc.

· FPP-as-a-service: production of small batches of series products

· Process development and customization of equipment

## Available equipment

· **SAMBA Step L** system
  · Large Kuka KR 60-3 placement robot mounted on KUKA linear rail; flexible space for customer tool
  · Flexible material feeding table; max. dimensions ~ 200 x 300 mm²
  · Part size envelope (LxWxH): ~ 2 x 3 x 2 m²



· **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

· **Software** stack:
  · CAD: Autodesk Inventor, ARTIST STUDIO | FEM: Altair Hyperworks | CAM: ARTIST STUDIO

# Partners & references

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

## **References** (selection)

GFM
PREMIUM AEROTEC
CIKONI composites innovation
Leonardo
The Boeing Company
NIAR Wichita State University National Institute for Aviation Research
Fraunhofer IGCV
Hochschule Augsburg University of Applied Sciences
TUM
LCC Lehrstuhl für Carbon Composites

## Strategic partners

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

AIRBUS
AUTOMATION baumann
FPC FIBER PLACEMENT CENTER
PCCL Polymer Competence Center Leoben

## 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

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## 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.

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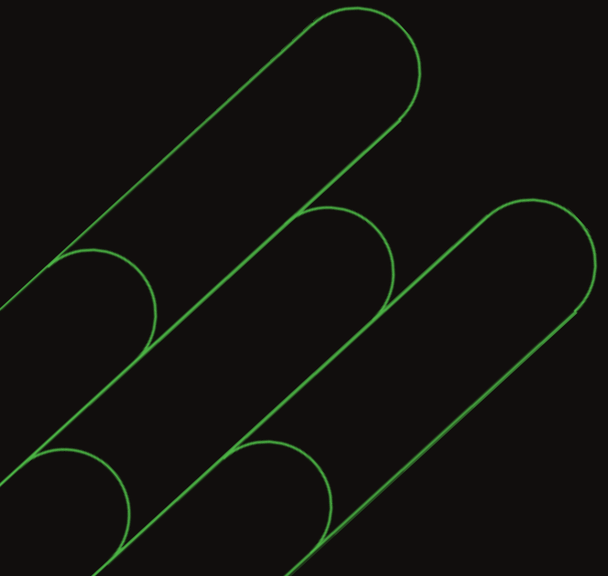

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