



## Advanced Robotics Made Simple

From Planning to Optimization -  
Redesigning Robot-based Automation Processes



After the first talks and presentations I knew: that's exactly what we need. The Robot Programming Suite enables us to do universal robot programming at a higher level.

Uwe Wachter  
Head of Production Tech Center Robotics and Vision at ZF Friedrichshafen

## ARTIMINDS: YOUR HOLISTIC ROBOTICS PARTNER

Robotics is our passion. As a technology leader and expert in robot-based, sensor-assisted automation, we are helping manufacturing companies to automate production processes and integrate robotics into their manufacturing.

We are convinced that the flexible use of robots is a key success factor on the way to future-proof production.

That's why our team of experienced developers, programmers, engineers and application experts bring software and robotics together to simplify and standardize the planning, programming and operation of robots for companies.



### ROBOTICS SOFTWARE

- + ArtiMinds RPS & LAR: online/offline programming & analysis
- + Broad hardware support (robots & peripherals)
- + > 1000 installations
- + Sensor Package for force & vision



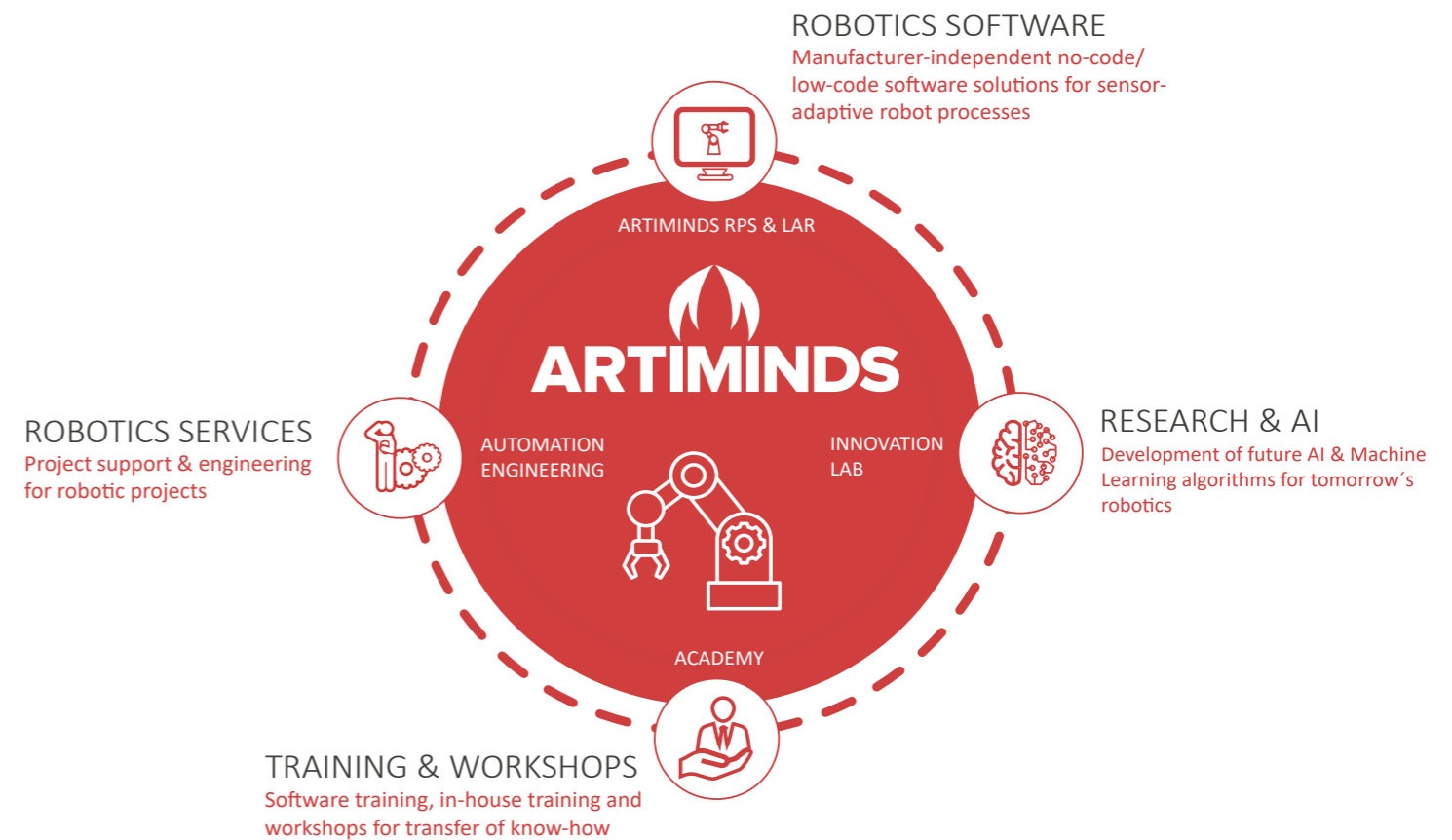
### ROBOTICS SERVICES

- + Process development
- + Feasibility studies/PoC
- + Prototyping
- + Project support & engineering
- + Programming
- + Support during commissioning



### ROBOTICS TRAINING

- + RPS & LAR user training
- + Individual application specific training
- + Workshops for special topics
- + Workshops for transfer of project know-how



## SOFTWARE AND PROJECT SUPPORT FROM A SINGLE SOURCE

The hardware-independent software solutions we have developed are the key to programming sensor-based robot applications robustly and integrating them optimally into your processes.

With our robotics know-how, we support companies with customized services such as concept consulting, prototyping, feasibility studies or even programming of applications in all phases of implementation.

From rough tasks, such as surface processing or order picking, to the most delicate work, such as electronic manufacturing or quality control - with ArtiMinds, the most diverse areas and industries can be automated economically and flexibly, regardless of batch size.

Our holistic portfolio of services and solutions consisting of intelligent software tools, consulting, project engineering, services and future-oriented research makes us a strong partner for robot-based automation.



*Our integration team will now be able to apply what they've learned to cobot-driven manufacturing solutions in the future, which enables us to act even more innovatively and flexibly. In my experience there is no comparable software solution available in the market.*

*Andrew Laich  
Engineering Supervisor at Greene Tweed*



## ROBOTIC APPLICATIONS

### ASSEMBLY

Automation of assembly applications offers extensive automation potential. Challenges lie in high manufacturing tolerances that are usually still compensated manually.

In addition, assembly workstations are often found in high mix/low volume areas that are typically not accessible to the rigid workflows of classical robotics.

Examples of assembly tasks include THT assembly, cable assembly, gear assembly ...

### QUALITY CONTROL & INSPECTION

Automated quality control with robots can be found for example in the area of endurance tests or camera-based visual inspections for the flawlessness of products.

A classic challenge in this area is the reprogramming in case of workpiece changes as well as the evaluation and persistence of the generated test data.

Examples can be found in any kind of functional test like operating switches, contacting and energizing of electric motors, completeness check by camera ...

### WHY ARTIMINDS?

- + Compensate tolerances with force control
- + Process-oriented programming enables easy adoption
- + Flexible integration of cameras for part localization

### WHY ARTIMINDS?

- + Out of the box storage of process parameters with ArtIMinds LAR
- + Easy reprogramming when changing components
- + Integration of standard vision solutions through automatic interface generation

### SURFACE PROCESSING

Surface processing represents an extensive application area. The common challenge of deburring, grinding, polishing and additive (gluing, 3D printing) applications is the generation of complex robot paths for challenging surface geometries.

In addition, there is the need to limit applied forces to ensure that the surface is not scratched or damaged.

Examples include weld grinding, deburring, polishing, application of sealing material ...

### HANDLING & PICK AND PLACE

Pick & place is probably one of the best-known use cases for robotics. Picking up components from predefined pickup positions and placing them at predefined target positions is repetitive and easy to solve.

Handling tasks become more challenging when the feeding is not customized (e.g. in brown-field solutions), if the components are fragile or very small, or if flexible materials have to be handled.

Examples are e.g. bin picking, packing of cartons, alignment of seat covers ...

### WHY ARTIMINDS?

- + Automatic generation of robot paths from CAD files
- + Easily combine motions with force control
- + Data driven parameter optimization and force monitoring

### WHY ARTIMINDS?

- + Easy to combine with state of the art Bin Picking solutions
- + Simple creation of force monitoring
- + Fast and precise adjustment of program parameters such as gripping positions



*In the run-up, we had also looked at other software solutions, but quickly realized that these were out of the question for us due to the high complexity in programming and for economic aspects.*

*Roberto Verduci  
R&D Manager at Galli*

## SOFTWARE AS KEY TO SUCCESS

### ARTIMINDS ROBOT PROGRAMMING SUITE (RPS)

ArtiMinds RPS stands for a new generation of automation. It is flexible and universally applicable, delivers robust solutions and is transferable to different applications. The various software packages can be combined as needed and give your robot a high degree of intelligence for the optimal implementation of your tasks. In this way, the process know-how of your employees is ideally combined with modern, flexible automation solutions.

### ARTIMINDS LEARNING & ANALYTICS FOR ROBOTS (LAR)

Robot applications provide a large amount of live data about your production processes. The ArtiMinds LAR software collects, segments and analyzes this data from the robot programs that were created with ArtiMinds RPS. To protect your production know-how and to ensure the traceability of your processes, the data is stored locally at your site.

#### ARTIMINDS RPS PAYS OFF FROM THE FIRST PROJECT:

The use of ArtiMinds RPS enables significant savings compared to classical automation solutions. The plant maintenance, the handling of variances and the transferability of existing solutions to new tasks have never been so easy. With ArtiMinds you automate your processes robustly. Thanks to ArtiMinds RPS it is possible for the first time to profitably automate even complex processes.

#### DETAILED INSIGHTS - THE NEED FOR FISHING IN THE DARK IS OVER WITH ARTIMINDS LAR:

Instead of just providing general information about the robot, ArtiMinds LAR is a tool for analyzing data and deriving optimizations in a targeted manner, focussing on the individual sub-processes and the tasks to be solved. The modern web interface offers not only flexible access, but also visualizes figures, KPIs and indicators to evaluate and continuously analyze data and processes, to monitor and optimize them continuously.

Combine robust sub-processes to create complex robot programs

Simple robot configuration through a large hardware library

Drag & drop of program templates

Simulation & validation for reachability analysis and collision checks

Generate tool paths for complex CAD geometries



## SUITABLE & SUPPORTING IN ALL PHASES

### PLANNING & PROGRAMMING

ArtiMinds RPS provides over 70 program templates with which you can create your robot program modularly via drag & drop.

Especially when it comes to complex applications with a variety of sensors such as force-torque sensors and 3D cameras, these predefined and proven sub-processes save a lot of effort and time during configuration and ensure a robust program flow. Even electrical grippers or a PLC can also be easily

connected. You can determine your individual robot via the integrated configurator.

The 3D simulation environment makes it possible to check accessibilities and to visualize collisions as early as in the planning phase. The software also supports you with collision-free path planning or the generation of tool paths for complex CAD geometries.

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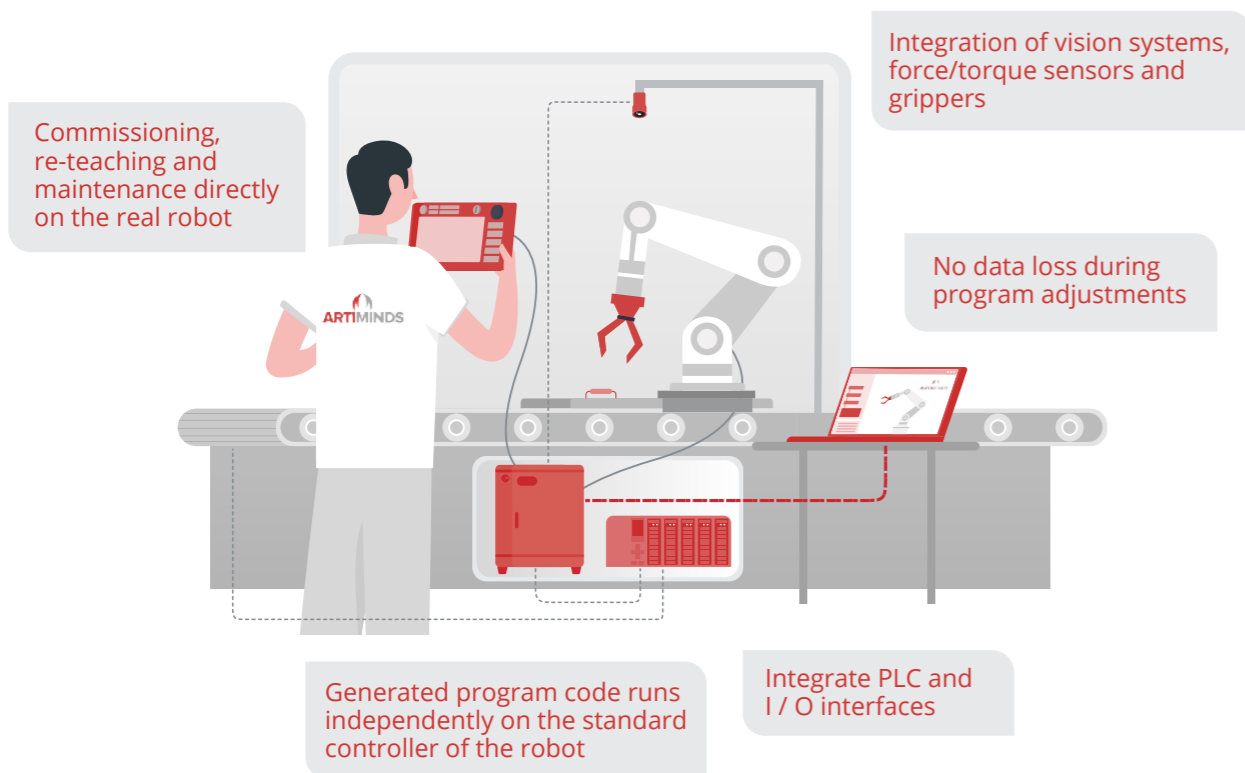
ArtiMinds RPS is designed to be very intuitive. With the two-day training and a little familiarization, anyone can program a robot within a few days. Programming knowledge is not required. The software structures individual program steps granularly, which makes individual assembly processes easier to understand and the search for errors much simpler.

Florian Beer  
Project Manager Robotics and Automation at Siemens Healthineers

## COMMISSIONING & OPERATION

With ArtiMinds RPS, you can generate native program code that runs independently on the standard robot controller – without having to write a single line of robot code. This enables you to use any functionality of your robot controller at any time. Thanks to the seamless combination of online and offline programming, commissioning and maintenance as well as re-teaching of individual points is possible directly on the real robot at any time. Furthermore you can transfer changes made on the robot controller back into the software or

carry out an automatic comparison of the robot code and the RPS program. ArtiMinds RPS expands your toolbox with a flexible programming software that can be integrated into automation systems as easily as it can be integrated into new plants. You can either generate only certain sub-processes while other parts are programmed "classically". Or you can use ArtiMinds RPS as a standard software to solve complete robot processes.

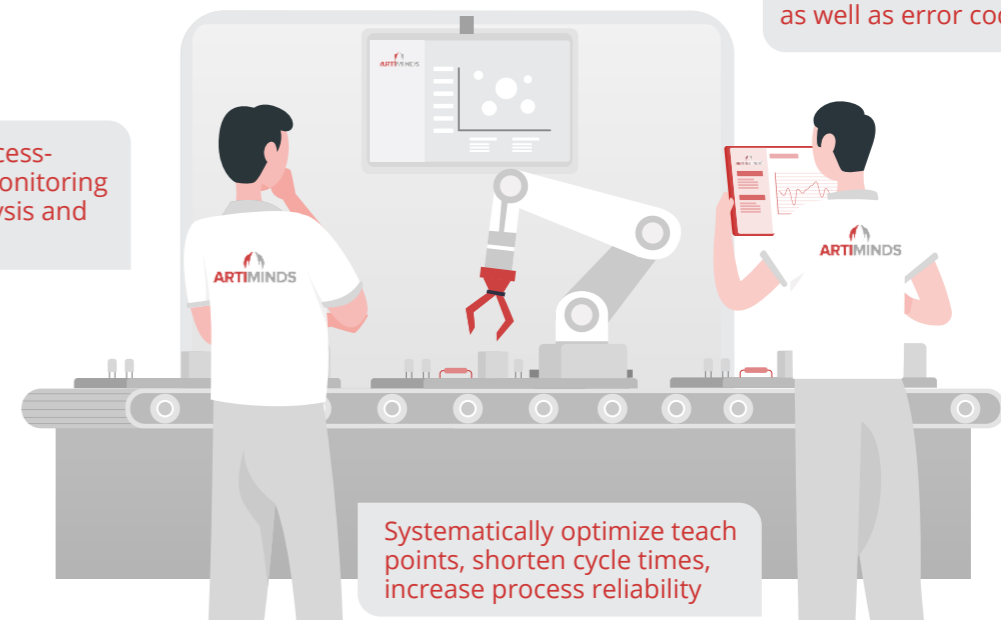


Web-based analysis & local data storage

Detailed analysis of automatically segmented sub-processes

Automatic recording of movements, force sensor and camera measurements as well as error codes

Create process-oriented monitoring tasks, analysis and KPIs



## ANALYSIS & OPTIMIZATION DURING OPERATION

The focused analysis and optimization is the most important step after programming: ArtiMinds LAR automatically records live sensor data such as movements, force-torque sensor and camera measurements or error codes and evaluates them. The data is only stored locally and made available to you via a web application. This ensures you to stay flexible and have mobile access at any time. The di-

vision into sub-processes is done automatically. This allows you to carry out a quick, targeted and detailed analysis particularly for your process. The data is processed graphically and numerically, allowing you e.g. optimizing teach points, shortening cycle times and thereby increasing process reliability.



## SOFTWARE PACKAGES

### ARTIMINDS RPS

ArtiMinds RPS combines online and offline programming seamlessly and intuitively to create complex robotic programs without effort- and without writing a single line of source code yourself. The program is assembled in a clear graphical software environment by dragging and dropping function blocks (templates). Key positions can be taught either offline in the integrated 3D simulation environment, or directly with the real robot via Ethernet connection. Finally, the program is automatically compiled into native robot source code, which is loaded onto the controller and can be executed independently of ArtiMinds RPS.

### SENSOR PACKAGE (FORCE & VISION)

By attaching force-torque sensors or vision systems, the robot learns to see and feel. The Sensor Package contains extensive templates with intelligent algorithms to create sensor-adaptive programs without in-depth programming knowledge. With just a few clicks, search movements for variance compensation, joining operations to avoid canting, or visual localization of components and inspection tasks can be implemented.

### ADVANTAGES:

- + Intuitive programming with templates and teach wizards
- + Reachability & collision calculation and integrated 3D simulation
- + Easy & automatic generation of tool paths from CAD files
- + Integrated interfaces to peripherals such as grippers or PLCs
- + Generation of native source code, which can be easily integrated into existing solutions

### ADVANTAGES:

- + Simple but robust generation of highly complex force controls
- + Automatic generation of interfaces with proprietary camera software and force-torque sensors
- + Fast and centralized customization of control parameters with automatic generation of controller code in native robot source code

### ARTIMINDS LAR

ArtiMinds LAR is the central solution for analyzing robot process data for holistic monitoring and optimization of automation processes. The tool analyzes live sensor data of the robot such as occurring forces, tool paths and velocities and automatically combines them with process information such as part serial numbers, process steps and sequence information. The software persists all data in a local, user-managed database and offers, in conjunction with the template structure from ArtiMinds RPS a simple, data-driven analysis of the process flows. The application scenarios range from the monitoring of critical parameters and calculation of process KPIs to the optimization of teach points and predictive maintenance measures.



*ArtiMinds LAR enables us to take a targeted approach to process optimization and troubleshooting. This eliminates the need for fishing in the dark. With LAR, we can automatically record all the data and, thanks to the seamless documentation, isolate errors within a short time.*

**Sascha Schwier**  
*Technical Manager at Primus Präzisionstechnik*

### ADVANTAGES:

- + Easy creation of process analyses in an intuitive web interface
- + All data is stored locally. No cloud access necessary
- + Combines classical monitoring with machine learning approaches to predict future behavior
- + Automatic integration of robot programs created in ArtiMinds RPS
- + Upgradeable for classically programmed robots

# RPS - EFFICIENT PROGRAMMING

## AUTOMATIC CODE GENERATION:

- Native program code in manufacturer-specific robot language
- Code runs independently on the robot controller without the need for an additional PC
- Flexible combination: Generated code can be easily integrated into classically programmed systems

## CLEAR USER INTERFACE:

- Clear division into simulation and programming area
- Switch between online and offline programming with just one click

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2256 actualDp[0] := 0
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2258 setActualDp[0] := 0
2259 IF (IsActualDp[0] > 0) THEN q_startPos[0] := q_startPos[0] + 0.001
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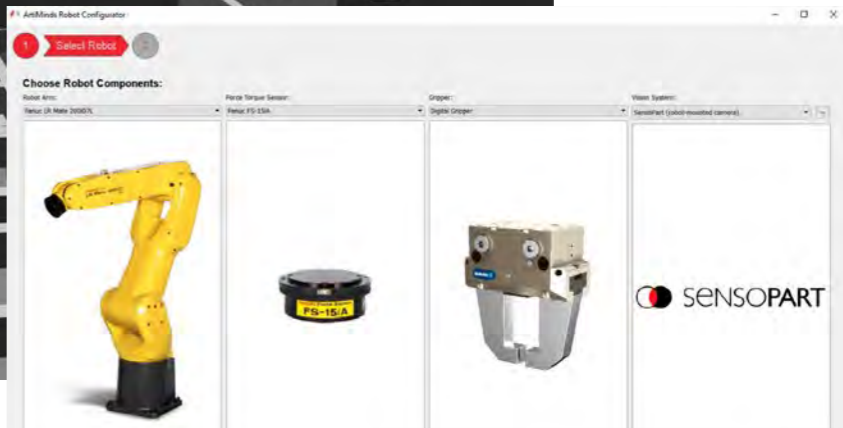
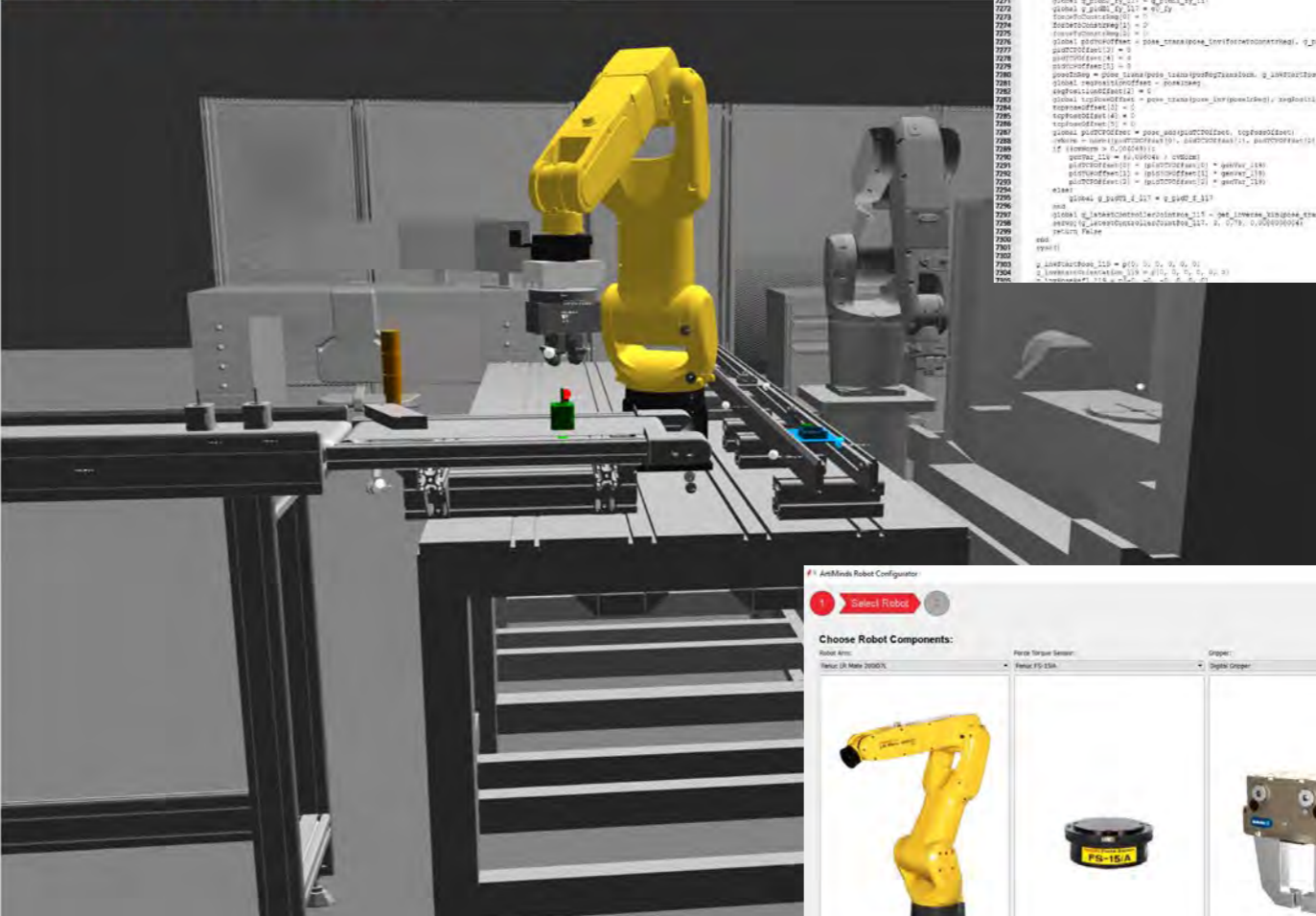
## GRAPHICAL PROGRAMMING:

- Program creation in form of a process sequence using function blocks
- Simple motion parameterization via interactive wizards



## EXTENSIVE TEMPLATE LIBRARY:

- Structure according to movements
- More than 70 function blocks and more than 100 builders
- Possibility to integrate your own code sections in native robot programming language



## EXTENSIVE HARDWARE INTEGRATION:

- Robot configurator enables quick set up of the hardware used
- All required interfaces are automatically created in the generated code

## CONTEXT-BASED HELP:

- Interactive help that adapts to the current work step
- Find video tutorials directly in the software for better comprehensibility

## SIMULATION & CYCLE TIME ESTIMATION:

- Complete simulation of tool paths in 3D environment
- Integration of CAD files for collision-free path planning
- First cycle time estimation during simulation, concrete cycle time measurement during real execution

## SUPPORTING WIZARDS:

- Guided teaching through clearly arranged wizards for each module
- Simple and fast re-parameterization
- All parameters are numerically adjustable in addition

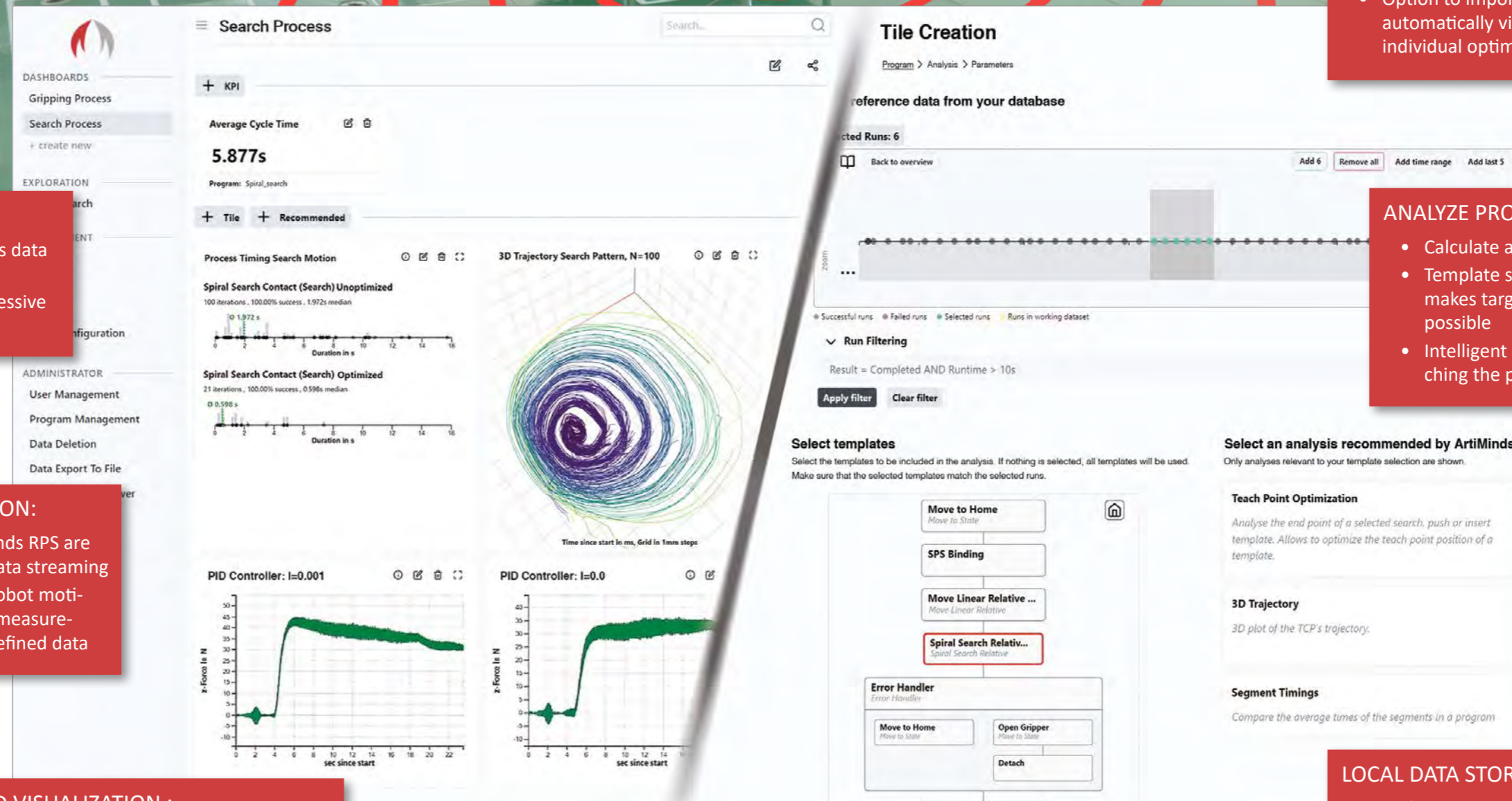
# LAR - ANALYZE OBJEKTIVELY

## WEB-BASED USER INTERFACE:

- Access and data transparency at any time, also via mobile devices
- Graphical visualization of data and KPIs

## OPTIMIZE CYCLE TIMES:

- Automatic calculation of optimal teach points for force-controlled movements
- Analysis of cycle time improvements through optimization
- Option to import optimized parameters automatically via SPS or to perform individual optimizations manually



## EASY TROUBLESHOOTING:

- Analysis and comparison of process data from past runs
- Detect invisible deviations and excessive high forces

## ANALYZE PROCESSES EASIER:

- Calculate and display key indicators
- Template structure from Artiminds RPS makes targeted analysis of sub-processes possible
- Intelligent suggestions for analyses matching the program

## AUTOMATIC DATA ACQUISITION:

- Robot programs from Artiminds RPS are automatically prepared for data streaming
- Storage of live data such as robot motions, velocities, force-torque measurements, error codes or user-defined data

## 2D/3D VISUALIZATION :

- Variety of visualization forms suiting the process
- 3D plots for the representation of real motion sequences
- 2D plots for detailed deviation analysis
- Segmented cycle time analysis to identify optimization potentials

## AUTOMATIC MONITORING:

- Set up rule-based monitoring
- Notification in case of rule violation for quality assurance of the workpiece
- Statistical calculation of parameter scatter

## LOCAL DATA STORAGE:

- Self-managed storage of data scales from local end device to enterprise cloud
- Permanent traceability of all historical data for quality assurance and audit trails



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The collaboration with ArtiMinds was very professional and cooperative. By means of a feasibility study and prototyping, the team first tested the realization of our demanding application and also supported us during the integration. As customer, we knew at all times at which point we were in the project.

Thilo Steinberg  
Head of Production Engineering at Siemens, Allach plant



## PROJECT SUPPORT & ENGINEERING

According to your individual requirements, our experienced Automation Engineering team can support you in all phases of your project. For process development and validation, which takes place in close cooperation with the customer, we use our in-house software solutions.

Until the final transfer of the results to the shop floor, e.g. together with your machine builder or system integrator, we are the right partner for your robot-based automation project!



### CONCEPT DEVELOPMENT

- + Idea development & consulting on feasibility
- + Simulations with cycle time & reachability analyses
- + Consulting in hardware selection
- + Co-designing plant concepts
- + ...



### CONCEPT VALIDATION

- + Robot feasibility/process studies
- + Robot programming & configuration
- + Performance tests in maximum tolerance range
- + Detailed process data analysis and evaluation
- + ...



### TRANSFER

- + Support & training
- + Support during commissioning
- + Duplication of the robot solution to other plants and to other hardware
- + Transfer of know-how for capability of independent reprogramming
- + ....

## ARTIMINDS: YOUR PARTNER FOR DEMANDING ROBOTIC PROCESSES

From developing the automation idea, to concept development, to prototypical implementation of the robot application as a feasibility study - our Automation Engineering team consisting of software developers and project engineers has many years of experience in robot-based automation and sensor-adaptive robotics.

### AUTOMATION ENGINEERING BY ARTIMINDS - YOUR ADVANTAGES:

- We are experts in the field of sensor-based robot applications and together with you we explore and develop new automation potentials
- Benefit from state of the art robotic strategies for your individual process and from the application experience of our Automation Engineering team
- You have complete cost control: We arrange our projects in reasonable, structured project phases to guarantee clear exit-points in case there is a lack of feasibility and profitability
- Minimize your project risk right from the start, as we take potential hurdles into account during the development and validation phase and work out solutions
- You accelerate your project progress and quickly obtain presentable results on the way from automation to series production
- Profit from the close collaboration with our ArtiMinds experts since we convey findings and project results directly to your team and thus build up your internal robotics know-how



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The very big advantage is that I can use a single platform to harmoniously integrate and control all components and sensors such as robots, cameras, force-torque sensors, grippers and motors in the process. I don't want to miss ArtiMinds RPS anymore, because it simplifies working with robots and makes even complicated processes feasible.

Michael Castien  
Robot Programmer at Primus Präzisionstechnik

## BROAD HARDWARE SUPPORT



- + ABB
- + DENSO
- + Fanuc
- + KUKA
- + Mecademic
- + Universal Robots
- + ...



- + ATI
- + OnRobot
- + Robotiq
- + Schunk
- + ...



- + OnRobot
- + Robotiq
- + Schunk
- + Weiss Robotics
- + Zimmer
- + ...



- + Cognex
- + Halcon
- + ifm
- + KEYENCE
- + SensoPart
- + Sick
- + ...



- + Digital I/O
- + EtherCat
- + IO-Link
- + PROFINET
- + ...

Broad manufacturer-independent support for robot hardware and peripherals - Status 2022

## INDUSTRIALLY ROBUST THANKS TO NATIVE CODE GENERATION

ArtiMinds RPS automatically translates the created program into the robot manufacturer's programming language, generating safe and verified program code. The native code is executed on the robot's own controller independently of ArtiMinds RPS and no additional hardware is required in the cell.

This means that the code can be subsequently modified at any time in the appropriate programming language. At the same time, it is possible to easily transfer back any changes that are made to ArtiMinds RPS, for example, during operation.

## SELECTION OF FEATURES & FUNCTIONS

	ArtiMinds RPS	Sensor Package*	ArtiMinds LAR*	Full Package
<b>INTUITIVE ROBOT PROGRAMMING</b>				
Program development from templates via drag & drop	✓			✓
Offline programming with virtual robot	✓			✓
Point-oriented program creation	✓			✓
Generation of tool paths from CAD files	✓			✓
Collision and reachability analysis	✓			✓
Simulation & visualization in 3D environment	✓			✓
Online programming with the real robot	✓			✓
Flexible hardware configuration and PLC connection	✓			✓
Live display of process data	✓			✓
Persistence and monitoring of process data				✓
Generation of native robot script code	✓			✓
Code generation in case of changed hardware setups	✓			✓
<b>SENSOR-BASED PROGRAMMING</b>				
Plug and play integration of force sensors		✓		✓
Generation of 6D force control in a few clicks		✓		✓
Automatic generation of search, contact & joining algorithms		✓		✓
Force superimposed spline toolpaths from CAD files		✓		✓
Display of occurring process forces		✓		✓
Persistence and monitoring of process forces				✓
Plug and play integration of camera systems		✓		✓
Transformation of camera coordinates into the robot system		✓		✓
Correct positions and movements via camera		✓		✓
<b>ANALYSIS AND OPTIMIZATION</b>				
Cross-cycle analysis of process data			✓	✓
Calculation of Key Performance Indicators (KPI's)			✓	✓
Cycle time analyses			✓	✓
Rule based monitoring of forces, positions, ...			✓	✓
Data based optimization of teach points			✓	✓
Version overview of all robot programs			✓	✓

\* Extension for ArtiMinds RPS

Find out more: [www.artiminds.com](http://www.artiminds.com)

## ABOUT ARTIMINDS

ArtiMinds Robotics develops software solutions to standardize and continuously optimize the workflow for the integration and deployment of industrial robots. Our goal is to simplify the programming and operation of industrial robots and to enable cost-efficient integration and maintenance as well as flexible automation.

We consider ourselves not only as software developer, but also as a comprehensive service and solution provider who implements, together with our customers, complex robot projects including force control, image processing and PLC communication.

As a pioneer for sensor-based robot applications, we are familiar with the challenges of our customers and encourage them in implementing their applications independently and building up know-how within the company.

With a team of over 40 employees and around 20 international distribution partners, ArtiMinds Robotics serves customers from a wide range of industries worldwide.

## CONTACT

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