



# HOW FLEXIBILITY IS REVOLUTIONIZING AUTOMOTIVE MANUFACTURING

Get to the next generation of flexibility  
with advanced robotics

LET'S GET TO IT



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# THE FUTURE OF THE AUTOMOTIVE INDUSTRY

The automotive industry is transforming at an unprecedented pace – driven by evolving consumer expectations and regulators' desire to elevate quality and safety standards while reducing carbon emissions.

These pressures are fueling the industry's push to diversify and produce an increasingly complex mix of assets for electric, hydrogen, and internal combustion engine (ICE) vehicles. At the same time, manufacturers face significant challenges in the form of labour shortages, supply chain disruptions, and rising costs.

Amidst all this change, the automotive industry remains fiercely competitive. Manufacturers must find new ways to increase productivity and reduce time to market – while remaining adaptable to variable automation requirements. Flexibility is the answer.

## HOW CAN ABB ROBOTICS HELP?

We empower your teams to improve the automation and connectivity of your production process. Our flexible, scalable solutions seamlessly integrate mobile robots to boost productivity, enhance quality and process control, and save time and costs.



# THE PATH TO AUTOMATION SUCCESS

Meeting automotive production’s challenges today – and being ready for tomorrow – demands revolutionary automation workflows and operations.

## Get to it with ABB Robotics’ Flexible Manufacturing concept.

Compared to the rigid lines of traditional automation’s fixed conveyors and manual transport, mobile robots offer a modular and connected solution that delivers complete control of your processes. Designing a flexible system that meets your present and future needs creates game-changing efficiency in complex environments.

ABB Robotics’ autonomous mobile robots (AMR) represent over twenty years of innovation, leadership, and global presence. With over 500 completed projects – including the successful deployment of AMRs for many global OEMs and Tier 1 manufacturers – we can be trusted to deliver the right technology and results, every time.

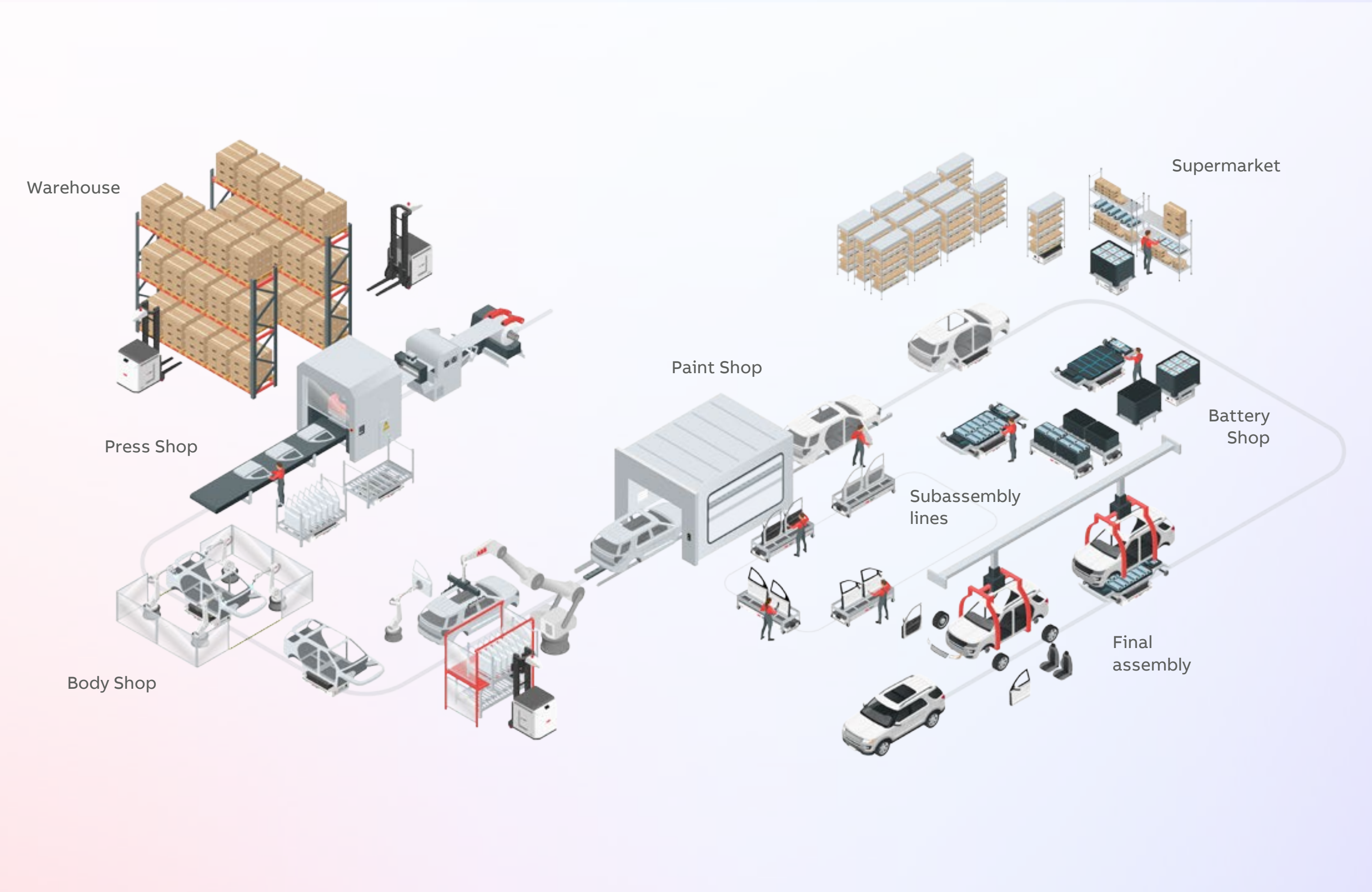
Our wide portfolio including industrial robots, AMRs and software meet the complex needs of modern automotive applications by integrating innovative technologies that enhance productivity, safety, and flexibility – streamlining operations with unparalleled precision. These capabilities also serve to increase efficiency, reduce waste, and promote sustainability by optimizing resource use.

Our solutions are even equipped with AI, 3D vision, and easy-to-use software, enabling them to perform complex tasks with greater intelligence, autonomy, and safety.

**EXPLORE OUR WHOLE PORTFOLIO**

### THE FOUR CORE BENEFITS OF FLEXIBLE MANUFACTURING:

- Flexibility
- Scalability
- Safety
- Costs



**FLEXIBILITY**

# FREEING PRODUCTION FROM FIXED LAYOUTS

The automotive sector must balance ICE and EV production alongside unpredictable fluctuations in order volume. But fixed production layouts make it hard to adapt, leading to multi-week shutdowns, massive capital expenditure, and increased operational risk.

Autonomous Mobile Robots (AMRs) solve this by making material flow flexible. Instead of fixed conveyors, routes are defined in software and can be changed in hours – not weeks – without major cost or disruption.

Production shifts from rigid lines to flexible robotic cells. And AMRs move parts between stations, where robots handle loading and unloading automatically. This reduces manual work and improves efficiency.

Manufacturers can also test and optimize layouts before implementation using digital tools like RobotStudio and AMR Studio. This helps identify issues early and ensures smooth deployment.

**The result is a more flexible, efficient, and future-ready production system.**



**SCALABILITY**

# SCALING INVESTMENT WITH PRODUCTION GROWTH

Moving from prototypes to full production comes with critical financial challenges – especially for those manufacturers that invest too much too soon. Fixed systems often require large upfront spending and leave capacity unused.

AMRs meet this challenge by making costs flexible. This means manufacturers can start small and scale production as demand grows, adding only what they need, when they need it. So instead of building large conveyor systems, manufacturers can use modular robotic cells supported by AMRs. Facilities begin with a few cells and a small fleet, then expand by adding more in parallel – without stopping production.

Standardized interfaces let AMRs connect directly with robotic cells, where robots handle loading and unloading automatically. This removes manual limits and keeps operations efficient. Before scaling, layouts can be tested using tools like RobotStudio and AMR Studio.

**Altogether, this ensures you only invest in the capacity you use, while remaining ready to scale – fast.**



**SAFETY**

# ELIMINATE RISKS WITH AUTOMATED MATERIAL HANDLING

Transporting heavy, complex automotive components like EV battery trays requires absolute precision. It is both physically demanding and full of risk. Alongside persistent labour shortages, manual handling is no longer a sustainable option for manufacturers. Meanwhile, legacy setups require secondary lifting equipment, and human-operated forklifts increase the risk of collisions, damages, and injuries – especially in busy spaces.

AMRs provide an intelligent solution through safe, predictable movement. Using technologies like VSLAM and 360-degree sensors, we ensure safety is built in. AMRs can navigate intelligently and remove the risks that come with human error or fatigue.

AMRs and automated systems can take over heavy lifting and material transport to reduce strain and keep workers out of high-risk areas. This creates a safer, more controlled production environment – where heavy lifting is handled by robots, employees focus on higher-value tasks, and safety helps to boost productivity.

**Trust that all designed interphases and engineering have been tested for a fully safe application.**



## COSTS

# MANAGE LABOUR SHORTAGES FOR A STABLE PRODUCTION

Finding and retaining skilled personnel is a consistent challenge for automotive manufacturers. Rising wages, high turnover, and human error make costs unpredictable and reduce efficiency.

Manufacturers need a structural buffer against workforce fluctuations and production disruptions. Fortunately, automated logistics and AMR-fed cells can help to insulate production targets from staffing deficits, securing a stable baseline run rate.

And in traditional setups, higher production means hiring more people – increasing both costs and complexity. Issues with forklifts and manual tasks can also lead to unexpected delays and downtime. With AMRs, production can scale without major increases in headcount.

Automated robotic cells can also handle transport and processing, reducing labour costs and improving quality. So facilities can start small and scale to continuous operations as needed, while workers focus on higher-value tasks like programming and maintenance.

**The result is lower, more predictable costs and stable production.**



# PRODUCTION APPLICATIONS IN THE PRESS SHOP



## END-OF-LINE RACKING

Our press shop solutions automate the entire process – from raw metal sheets to finished parts. We provide flexible de-stacking, fast inter-press handling, and scalable end-of-line racking for smooth, efficient production. The result is high speed, accuracy, and safety.

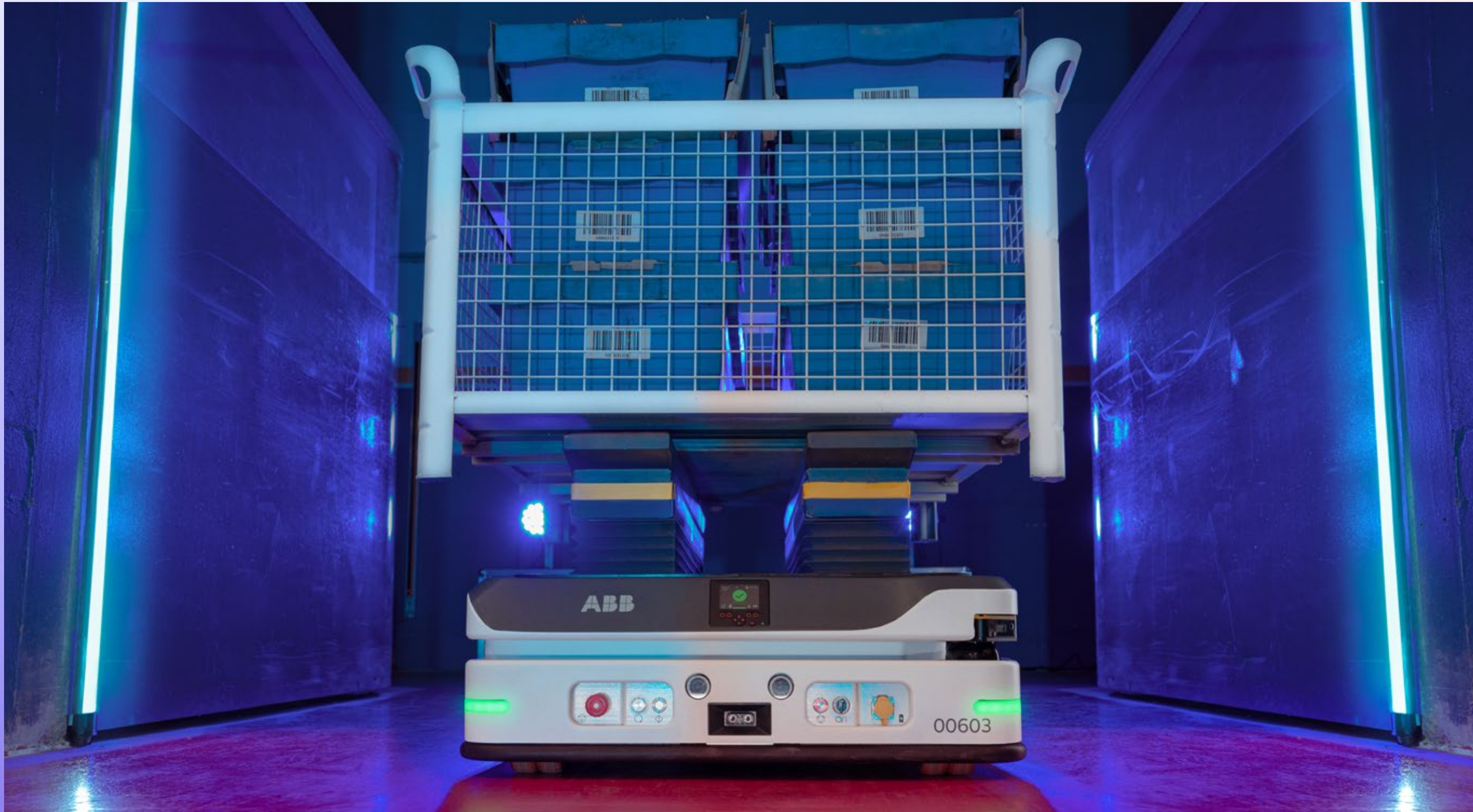
At the end of the line, the robot unloads the last press onto the conveyor where robots place the already located and quality-checked parts into their corresponding racks. Once each rack is loaded, the AMRs move the finished parts to the warehouses before the next vehicle manufacturing process.

You can easily add new routes or cells as volumes grow or new parts are introduced to keep your operation efficient.

Take all the way your logistics operation with automation of the press warehouses from the racking transfer area.

Our solutions have been studied and designed to implement smart systems and seamless integration along the whole end of line process.

# PRODUCTION APPLICATIONS IN MATERIAL PREPARATION



## KITTING TO ASSEMBLY FLOWS

Kitting groups related parts to ensure they arrive together – speeding up the selection and sequencing of each subcomponent by picking and placing into kits with cobots or robots.

In environments with predictable but flexible demand, Co/Robots are ready for preparation and AMRs deliver kits between defined pick-up and drop-off points, serving multiple lines without fixed conveyors.

AMRs work alongside manual stations and automated cells, with software interfaces linking fleet management to robots. This enables easy scaling and flexible deployment across OEMs and Tier 1 suppliers.

Combining Robots and AMRs to supply stations from supermarkets or buffer areas creates a decoupled material flow. Each station receives parts on demand, independent of disruptions elsewhere. This means production can continue despite delays, bottlenecks, or cycle time variations. And manufacturers can enjoy more resilient operation with fewer stoppages, higher uptime, and more stable production – essential for high-value automotive and battery assembly.

# PRODUCTION APPLICATIONS IN THE BODY SHOP



## SMALL-TO-MEDIUM BIW SUBASSEMBLIES

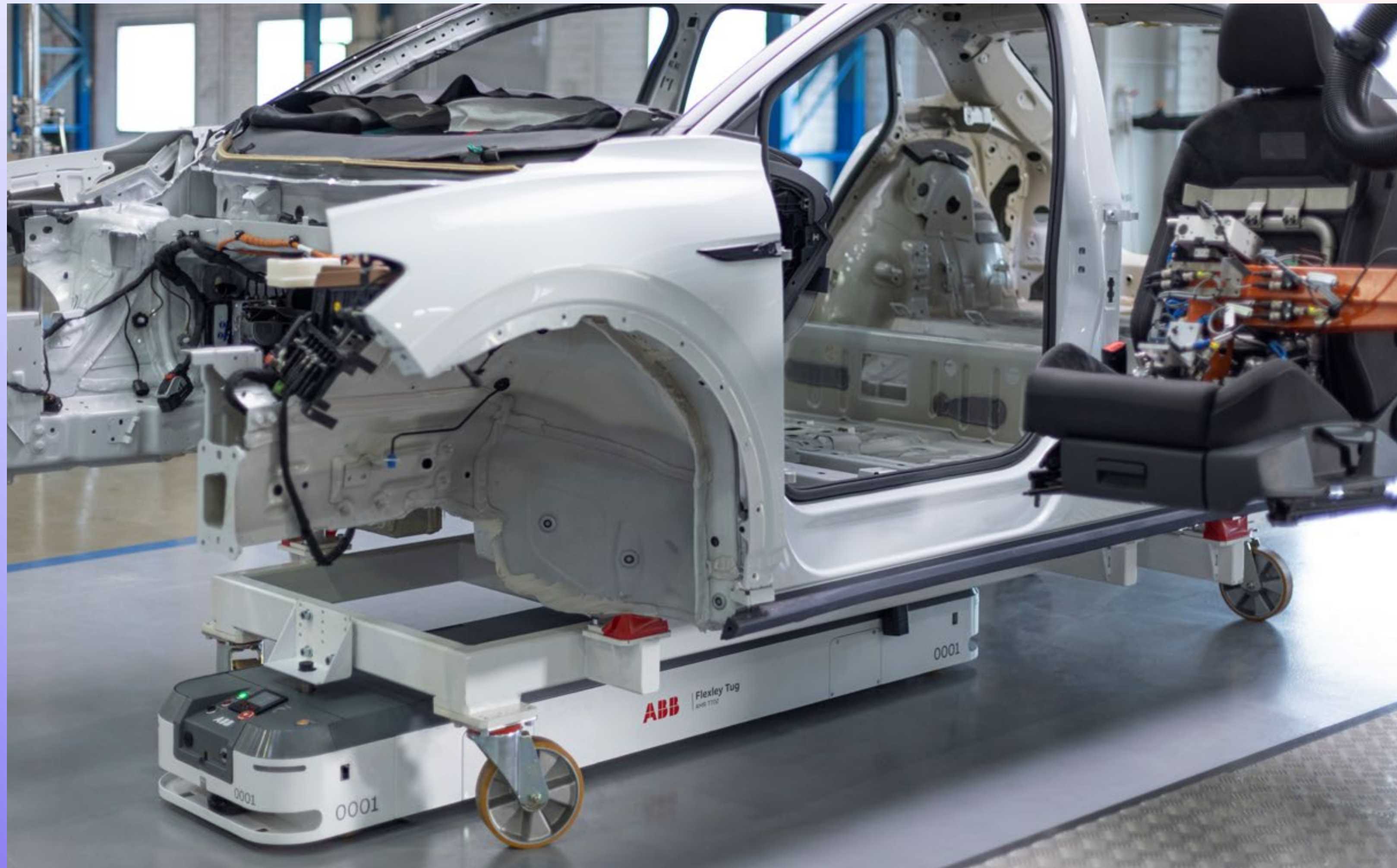
FlexArc® robotic welding cells are pre-engineered systems, available in several cost-effective, modular variants.

AMRs take over the logistics role by delivering fixtures, components, or subassemblies to the welding cells, and removing welded assemblies without manual intervention.

- **Easy reconfiguration:** Add, remove, or rearrange production cells without major downtime.
- **Coordinated flow:** AMRs deliver parts based on demand, reducing idle time versus manual feeding and lowering dependence on fixed transfer systems.
- **Mixed-model production:** Different part variants can be routed to different cells, fixtures, or welding programs as needed. AMRs help deliver the right material to the right station.

The result is a scalable welding setup that supports changing volumes, new variants, and phased investment.

# PRODUCTION APPLICATIONS IN THE FINAL ASSEMBLY



## INCREASED INTRALOGISTICS FLEXIBILITY AND LAYOUT AGILITY

Final assembly remains one of the least automated stages in automotive production. Unlike other areas, cars are in continuous motion along the line, making automation more difficult. As a result, flexible and scalable solutions that can adapt to changing processes are needed.

A key challenge is completing multiple assembly tasks – such as the installation of doors, dashboards, seats, and carpets – on a single moving line. This improves quality, reduces costs, and enhances ergonomics when done effectively.

Because of the speed and complexity involved, automation has been limited compared to areas like body-in-white, painting, and powertrain. Today, less than 5% of final assembly uses robotic automation.

This creates a major opportunity to introduce flexible automation that can increase efficiency, improve working conditions, and support future production needs.

## NEW HIGH-TRAFFIC AREA: THE MANUFACTURING SUPERMARKET

Supermarkets provide a high-traffic environment within OEM and Tier suppliers where demand is predictable but flexible.

These areas have clear pick-up and drop-off points, allowing AMRs to supply multiple lines without fixed conveyors. AMRs can also pick, kit, and sequence parts directly from the supermarket as needs change.

In automotive plants, supermarkets are more than a Lean Concept – they are the backbone of flexible automation.

# FROM DESIGN TO REAL-TIME ANALYTICS FOR FULL TRACEABILITY

It's never been more important to embrace digitalization. ABB Robotics solutions let you embed data-driven production and AI capabilities within your workflows – improving process and resource transparency, production agility, and compliance-related traceability.

Our solutions deliver optimized efficiency through predictive maintenance and real-time analytics. Digital-twinning technologies enable rapid simulation development and virtual robotics commissioning through software tools such as RobotStudio® and OptiFact™, helping you to visualize, simulate, and enhance your automation projects.

Advanced robot control systems like OmniCore™ and fleet management solutions, like AMR Studio, serve to keep your operations running smoothly. And across every stage of manufacturing – from the press shop to painting, arc welding, logistics, and pick-and-place – we provide application-specific add-ons, SDKs, and AppStudio that empower you to create tailored solutions.



# VSLAM

## BUILT-IN VISUAL INTELLIGENCE

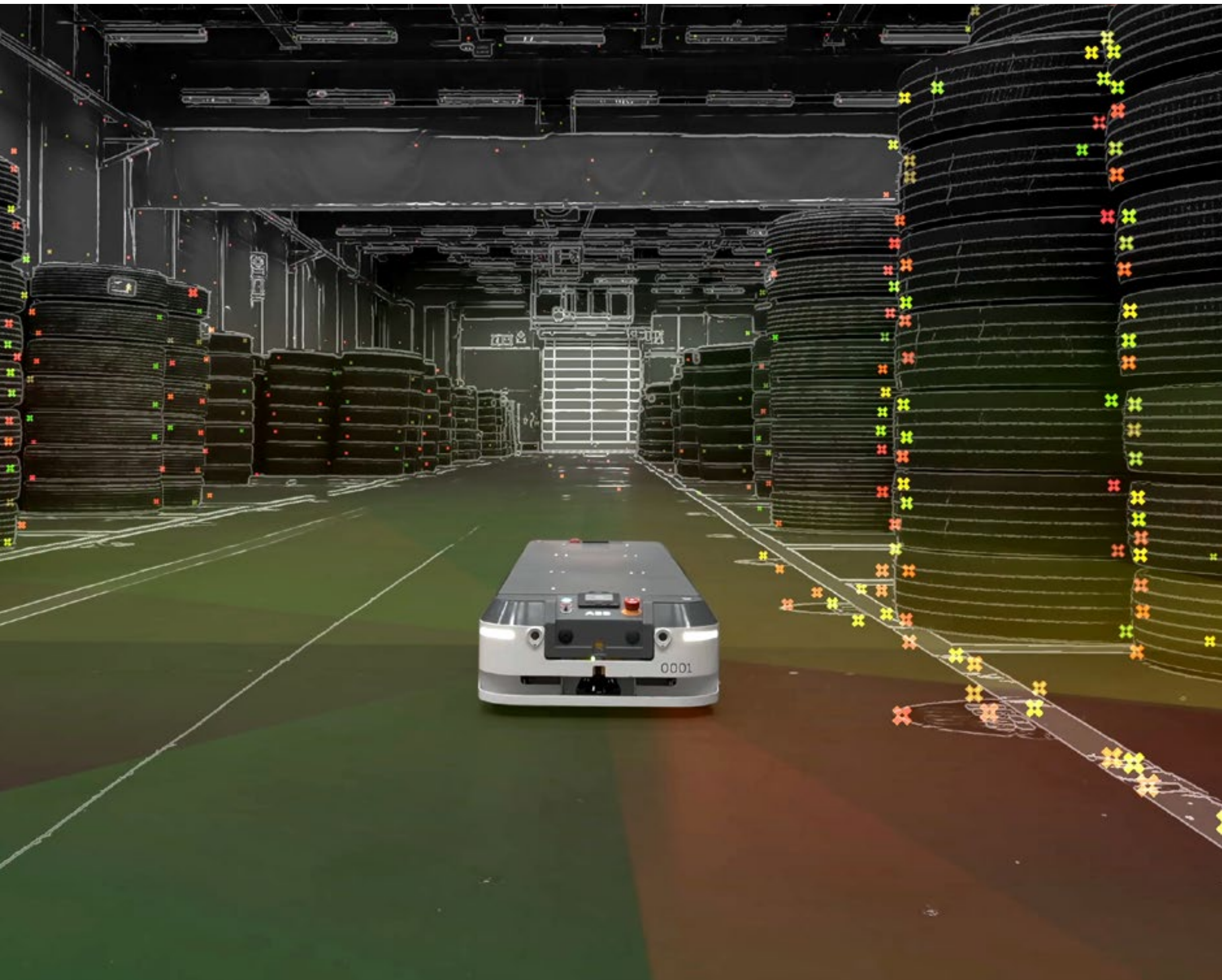
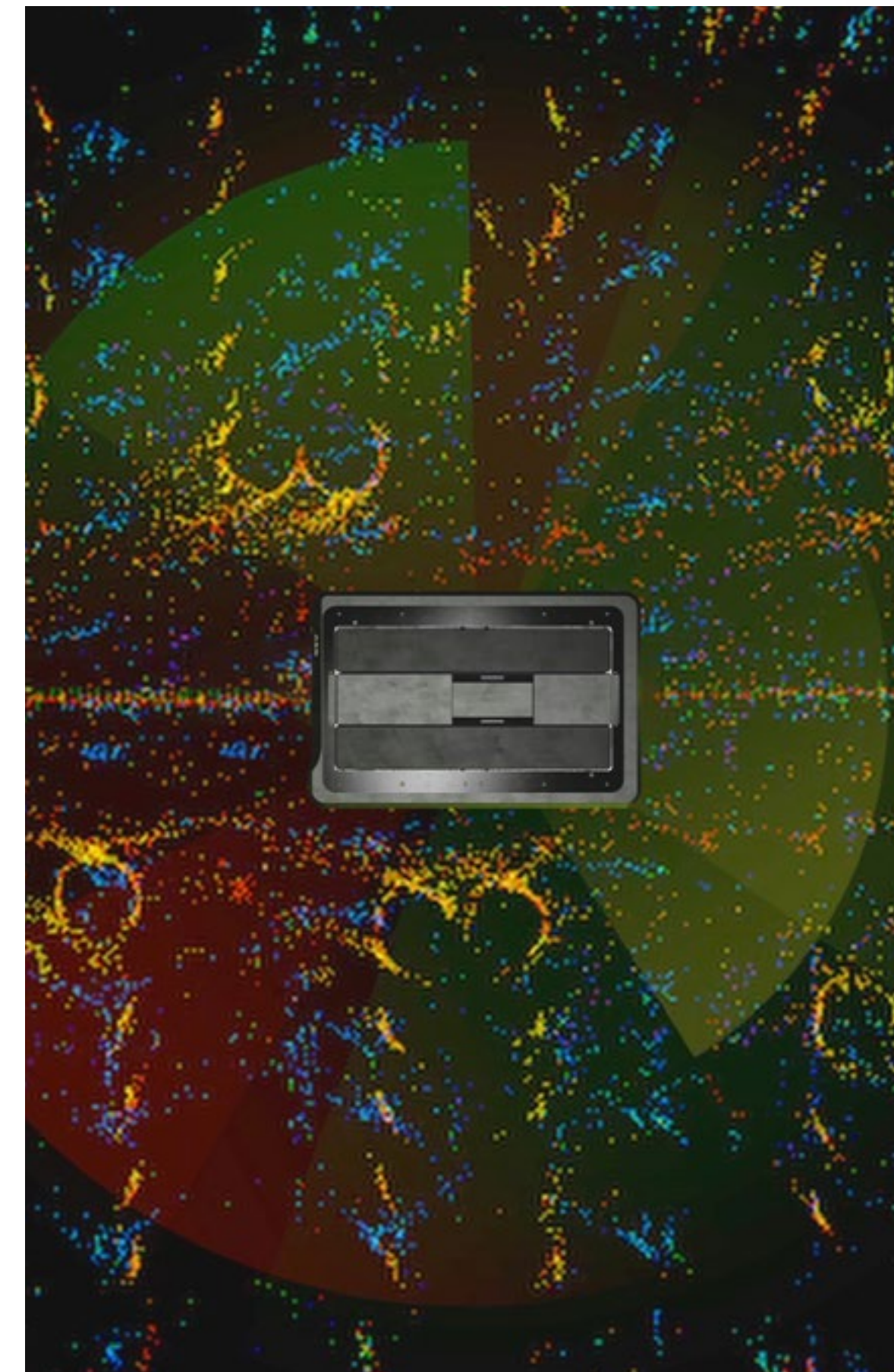


ABB Robotics is dedicated to building solutions that bring greater simplicity and flexibility to the automotive production process.



To support this ambition, we developed our cutting-edge navigation technology for AMRs: Visual Simultaneous Localization and Mapping (Visual SLAM or VSLAM). This AI-enabled 3D navigation capability provides unparalleled performance and accuracy – even in the most dynamic, unstructured, and challenging environments.

VSLAM creates a 3D map by using off-the-shelf cameras to detect and track natural features in the environment. AMRs can locate their position and navigate without the need for added infrastructure. The map also updates itself automatically whenever it detects changes in the environment to ensure that the AMR remains accurate and efficient.

VSLAM offers a more flexible and accurate layouts without the need for artificial references and tapes on the floor. Combined with our easy-to-use AMR Studio® software, manufacturers can optimize productivity and flexibility without compromising efficiency and quality.

# THE COMBINED POWER OF AMRS AND VSLAM

20%

Up to 20% faster  
commissioning

20%

VSLAM makes AMRs  
20% faster than 2D SLAM

±5MM

Up to ± 5 mm  
positioning accuracy\*



# ROBOTSTUDIO®

## VISUALIZE YOUR IDEAS AND REDUCE COMMISSIONING TIME

Our powerful programming and simulation software RobotStudio® enables customers to build, test, and refine their robot installation in a virtual environment, speeding up commissioning time and productivity.

RobotStudio now offers industrial-grade physical AI at scale

RobotStudio HyperReality extends ABB’s RobotStudio by integrating NVIDIA Omniverse libraries to close the long-standing sim-to-real gap in industrial robotics – making physical AI deployable at scale.

Manufacturers can now simulate robots in physically-accurate digital twins and generate synthetic data to virtually prepare robots for real-world production scenarios before deployment.

### KEY BENEFITS

99%

Close the sim-to-real gap with up to 99% accuracy.

80%

Cut setup and commissioning time by up to 80%.

40%

Reduce engineering and production costs by up to 40%.

50%

Accelerate time to market by 50%.



LEARN MORE ABOUT [HYPERREALITY](#)

# OPTIFACT™

## COLLECT, MANAGE, AND ANALYSE

OptiFact™ gives automotive manufacturers the real-time visibility needed to keep production running at peak performance – detecting issues early, cutting downtime, and maximizing the productivity of every robot on the line.

- 1. Reduce unplanned downtime in high-volume environments.**  
Automotive plants run on tight takt times – and any failure stops production. OptiFact™’s Robot Diagnosis engine analyses robot motion data and gives a 0–10 mechanical health score so teams can take action before breakdowns occur. The result: up to 20% more production time in complex lines.
- 2. Maintain process quality across hundreds of robots.**  
From BIW welding to press automation and final assembly, quality depends on consistent robot performance. OptiFact™ centralizes data from robots, PLCs, and sensors into ready-made dashboards – Cycle Time, Event Logs, Robot Health, and more – helping teams stabilize output and reduce rework.
- 3. Support flexible EV/ICE production with data-driven decisions.**  
Flexible automation can benefit more from intelligent monitoring to adapt continuously. OptiFact™ helps engineers detect performance drifts immediately, enabling smoother transitions between model variants and mixed production contexts.

OptiFact™ sees issues before your robots feel them, so you can keep your automotive line moving.



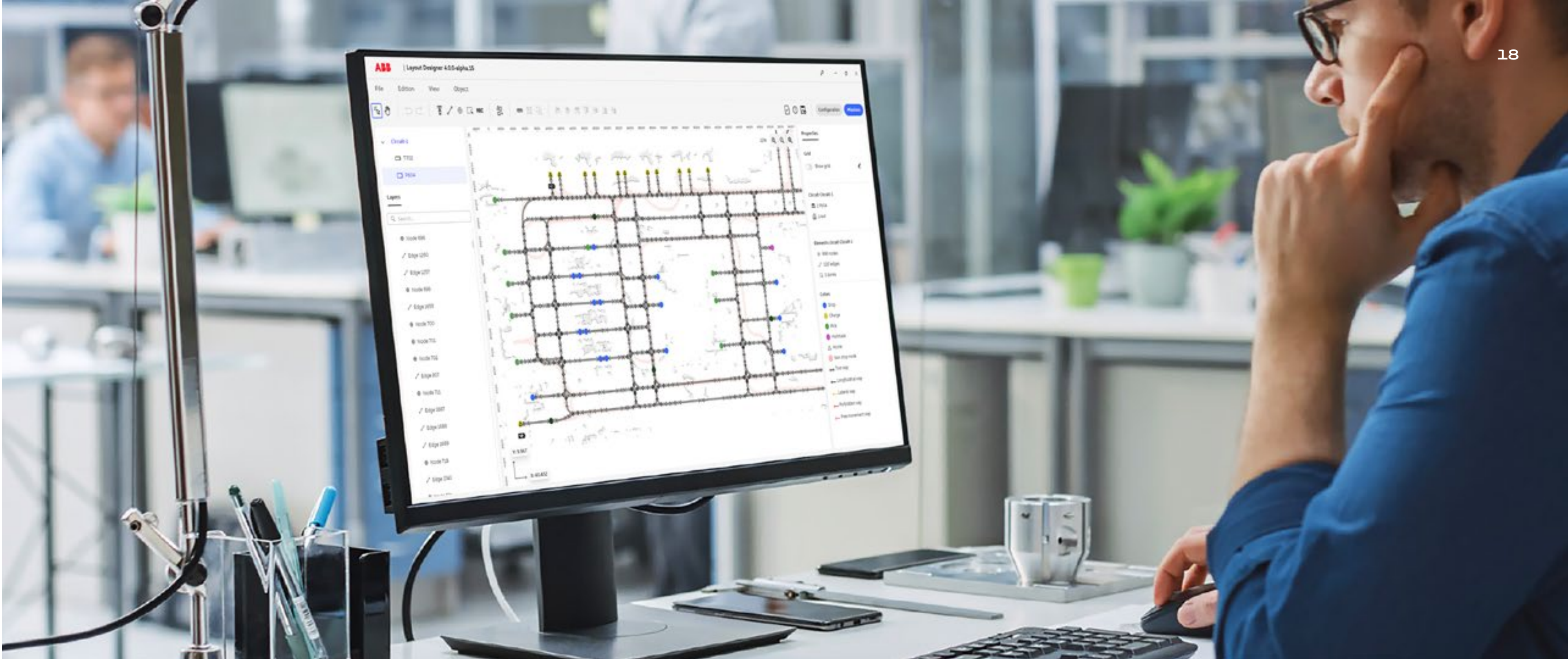
TAKE THE NEXT STEP  
WITH OPTIFACT

# AMR STUDIO® DEPLOY, CONTROL, AND OPTIMIZE

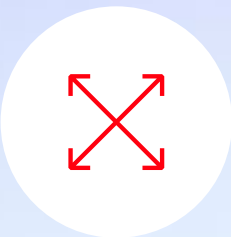
Achieving performance excellence in AMR operations is all about control – and that’s what you get with the AMR Studio® Suite. Our all-in-one, easy-to-use software suite includes two powerful tools:

- **AMR Studio®** to deploy and manage AMRs
- **AMR Studio® Fleet Manager** for real-time fleet and traffic control

Together, they make it simple to configure, deploy, and manage an entire fleet of AMRs from one intuitive platform.



## GET STARTED IN THREE SIMPLE STEPS:



### Map the environment:

Capture and record the operating environment, saving key locations to speed up deployment.



### Define the path and mission:

Establish the paths and program the logic and AMRs will follow using provided steps in the software.



### Share the project:

Distribute the project file across your fleet and launch the AMR with just one click.

## AMR STUDIO® FLEET MANAGER OPTIMIZE PERFORMANCE AT SCALE

Once deployed, the AMR Studio® Fleet Manager assigns the optimal AMR to each mission, controls traffic flow, and efficiently manages the entire fleet.

- **Intelligent order assignment:** Advanced traffic management algorithms assign the most suitable AMR for each task and determine the best routes, even in complex environments.
- **Customer-centric interface:** The intuitive interface enables users to monitor and manage fleet operations without external support.
- **Real-time insights & data traceability:** Monitor mission status, AMR performance, and battery levels in real time, ensuring maximum uptime and proactive intervention.

CASE STUDY:

# DRIVING LOGISTICS AUTOMATION AND SAFETY AT FORD

## Challenge

Eliminate all the manual forklifts and increase safety.

## Solution

- Installation of 60 AMRs to automate all logistic flows inside the Ford engine plant.
- Material handling automation deployed within assembly and machining lines.
- 60 Flexley Tug AMR T702 mobile robots used to automate the line supply, kitting, and end-of-line processes at the engine plant.

Thanks to their high pulling capacity, low profile, and bidirectional movement, the T702 AMRs are highly versatile, being able to automate the processes of transporting trolleys with raw material to the machining line, machined parts, and sequenced parts to the assembly line, and finished product to the quality station for later storage in the shipping area.

The machines in the plant are connected to the AMR via the AMR Fleet Management System, fully automatically managing the routes. In addition, operators give inputs to the AMR Fleet Management System via tablets or keypads, confirming certain steps for the AMRs to follow their routes and processes.

The AMR system has made it possible to increase the plant’s safety, as manual forklifts have been eliminated and replaced by collaborative autonomous vehicles equipped with safety elements. And the installation of AMRs has increased the plant’s efficiency, both in terms of processes and energy usage.



## Results

“With this, we achieve a safer and more efficient working environment for all of our workers. Right now, at Valencia Engine Plant, we have around 50 AMRs that are covering more than 20 routes, which make more than 60,000 km per year”.

**Alejandro del Portillo, Process Engineer, Ford**



## IN CONCLUSION

# ABB ROBOTICS SUPPORT AT THE CORE

Automation in the automotive industry is undergoing a tech-driven revolution, born from the need for increased process efficiency, flexibility, safety, security, and sustainability into an ever more connected, digitally enabled and optimized smart factory. One sole supplier, managed by one platform, combines all these benefits into a single source of advantage. ABB Robotics.

AMR solutions reduce dependencies on manual lifting, forklifting, and fixed, rigid transport lines. They're helping to make automotive production lines more productive and flexible – capable of coping with the mixed requirements of each manufacturing process, from press automation and chassis welding to final assembly.

ABB Robotics portfolio of robots, application cells and mobile robots can also be integrated seamlessly into smart flexible systems, quickly reconfigured to support plant expansions and production increases, and coordinated efficiently on the production floor through one digital system.

Customers can always rely on our global support organization – which offers training, customer support, spare parts, and advice in 53 countries and more than 100 locations.

So if you're looking for an intelligent way to augment human endeavour and elevate the efficiency of your company's processes, get to it with ABB Robotics.

**Get in touch with an ABB expert and let's  
get to a more flexible future together.**

**LET'S GET TO IT**





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**ABB** is a global technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. By connecting its engineering and digitalization expertise, ABB helps industries run at high performance, while becoming more efficient, productive and sustainable so they outperform. At ABB, we call this 'Engineered to Outrun'. The company has over 140 years of history and around 110,000 employees worldwide. ABB's shares are listed on the SIX Swiss Exchange (ABBN) and Nasdaq Stockholm (ABB). [abb.com](https://www.abb.com)

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**ABB Robotics** as one of the world's leading robotics companies, is the only company with a comprehensive and integrated AI-powered portfolio covering robots, cobots and Autonomous Mobile Robots (AMRs), designed and orchestrated by our value-creating software. We help companies of all sizes and sectors - from automotive to electronics and logistics – to outperform by becoming more resilient, flexible and efficient. ABB Robotics is at the forefront of developing and commercializing a new generation of Autonomous Versatile Robotics (AVR), leading a global innovation ecosystem of partners in advancing efficient hardware and intelligent software with industrial performance. The business employs approximately 7,000 people. [go.abb.com/robotics](https://go.abb.com/robotics)

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