

System 3R

# Lights-out manufacturing

with Autonomous  
Mobile Robots (AMRs)



# Becoming better every day – since 1802

## GF Machining Solutions

GF Machining Solutions is one of the world’s leading providers of advanced manufacturing systems for the production of high accuracy components and tools. Thousands of customers rely on our cuttingedge technologies including Electrical Discharge Machining (EDM), high-speed Milling, five-axis Laser Micromachining, and Additive Manufacturing. Our product portfolio also includes Spindles, Automation, high-precision Tooling, Digital Solutions and unrivaled Customer Services. In line with our targets and vision, the focus of GF Machining Solutions is to provide global customers with innovative, energy-efficient, sustainable, end-to-end production technologies for the most demanding applications.



+ We are System 3R.  
We are GF Machining Solutions.

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## AMR objective

Our objective is to supply the market with a range of AMR solutions. To support the lights-out factory vision, these solutions have to be flexible, agile and capable of transferring materials to/from mobile units.



# Lights-out manufacturing

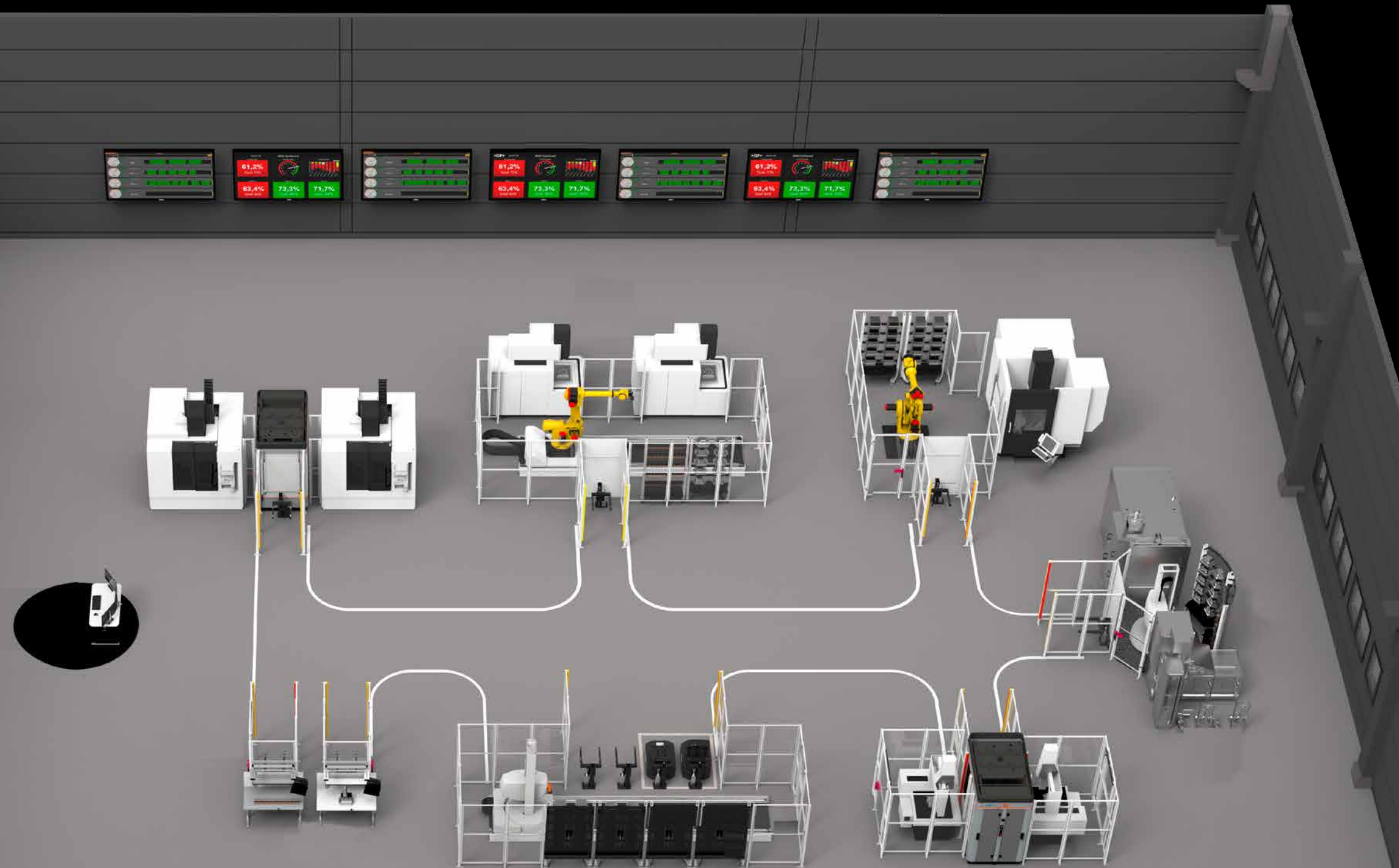
New and existing customers will benefit from our fully automated factory solutions.

These use AMRs to transport palletised workpieces, electrodes, cutting tools, raw materials, etc. between individual cells. Transport is safe and automatic.



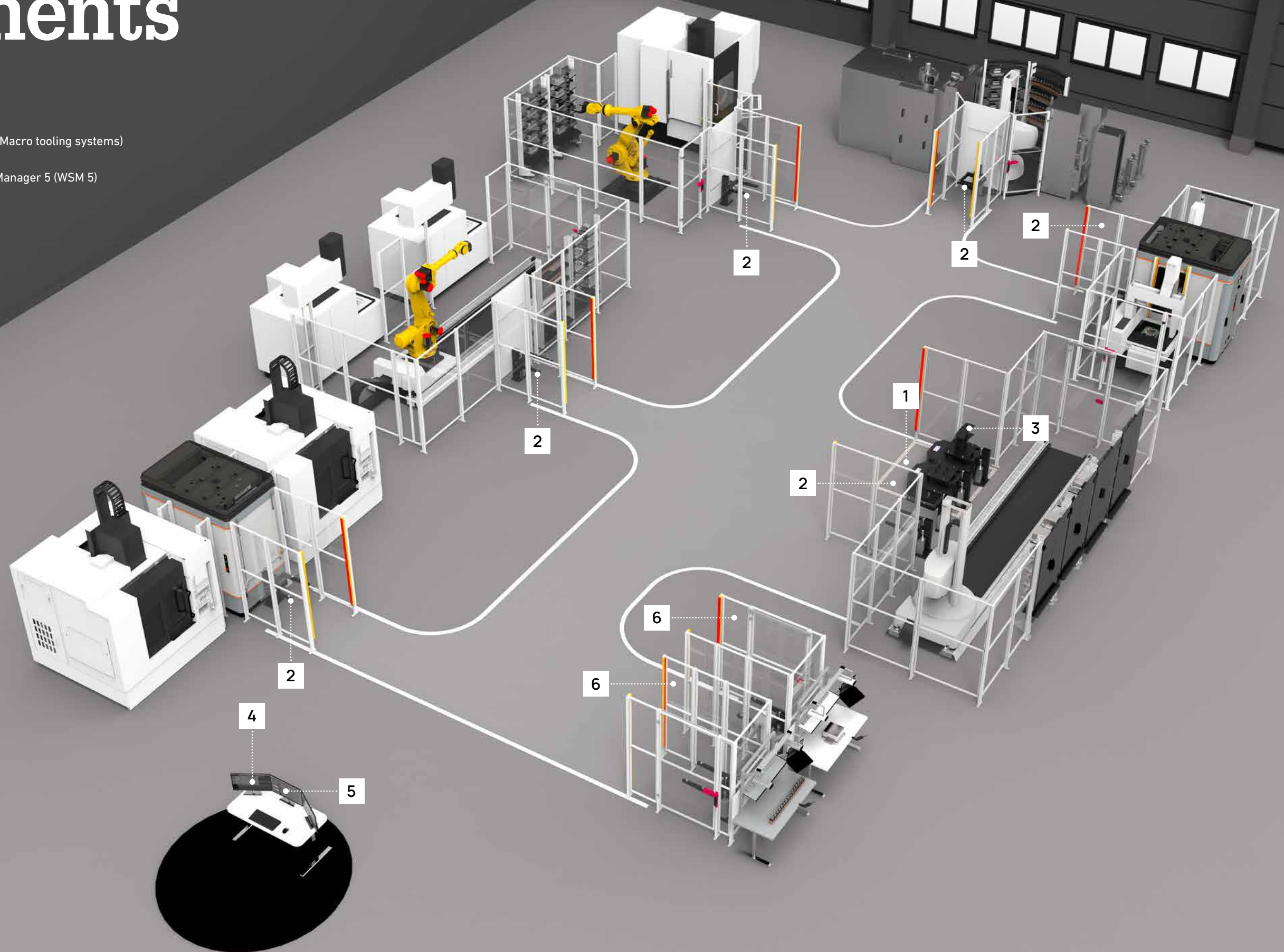
## Advantages of our AMR solutions

- Multi-technology support
- Scalable and easy to add more cells or AMRs
- Increased material management efficiency and reduced error rates
- Agility and flexible to meet changing demands (volumes)
- Accelerated product switching (higher product mixes)
- Suitable for both manned and unmanned use



# Components

1. Parking station with AMRs
2. Tray lift at production cell
3. Tray for pallets, electrodes, etc. (e.g. Dynafix and Macro tooling systems)
4. Fleet Manager (system handling each AMR)
5. AMR support is one of the features of WorkShopManager 5 (WSM 5)
6. Preparation and loading stations

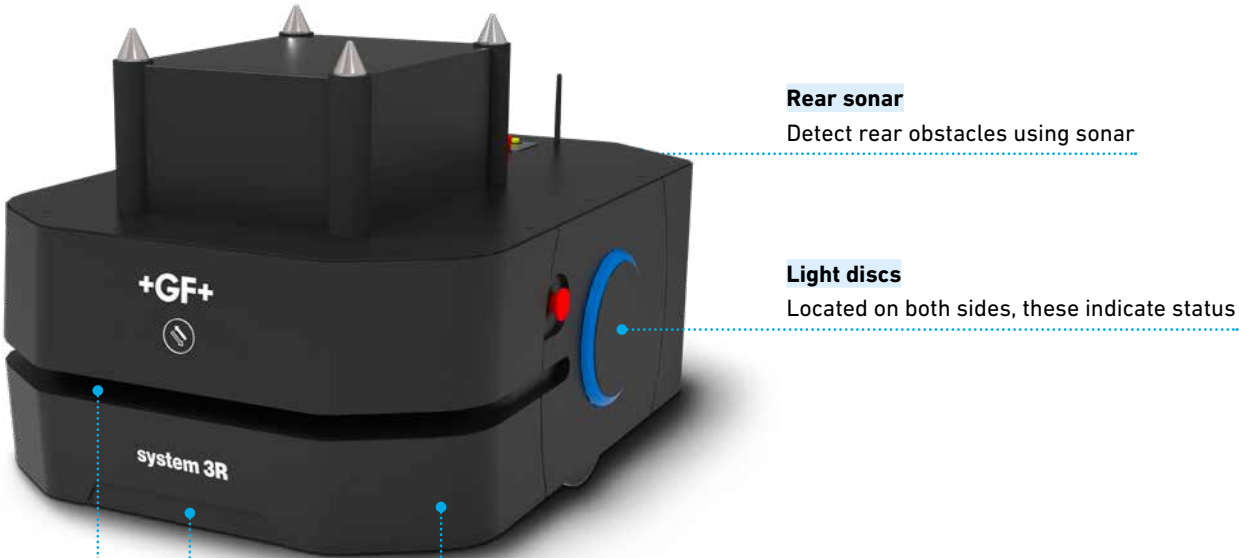




# Safety by Design

### Benefits

The fundamental purpose of AMRs is to serve human workers. Our AMRs are designed to meet the industry's latest requirements. The robots interact with people to promote a collaborative, safe, working environment. Safety lasers and sonar enable our robots to detect obstacles in their paths and prevent collisions.



**Rear sonar**  
Detect rear obstacles using sonar

**Light discs**  
Located on both sides, these indicate status

**Front bumper (LD90 model only)**  
Stops the AMR on contact with obstacles

**Low front laser**  
Obstacle sensor detects low-profile objects when moving forward

**Safety scanning laser**  
Safety-rated laser used for simultaneous localisation and mapping (SLAM) and safety function

- Safety features**
- No collisions with static or moving objects
  - Easy to add extra emergency stops
  - Compliance with ISO EN1525, JIS D6802 and ANSI B56.5 safety standards

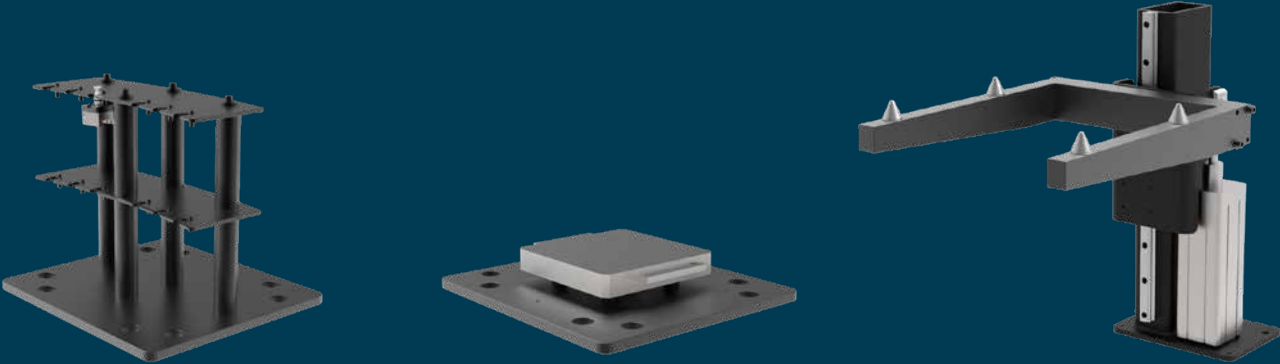
# Accessories



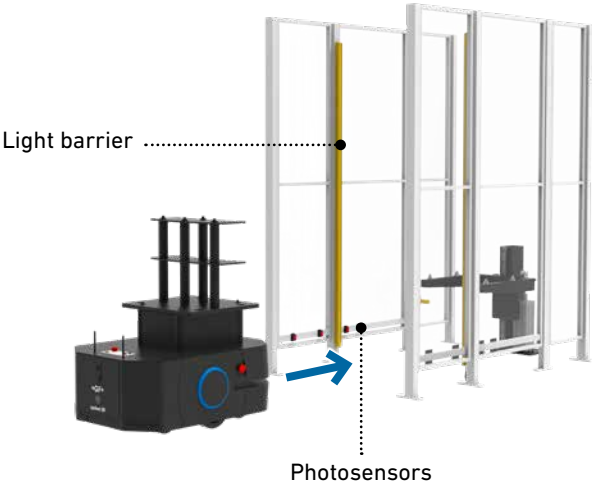
Electrode tray, Macro, 12 positions

Tray for pallet with workpiece

Tray lifter for robot cell



# Loading and unloading with safety components



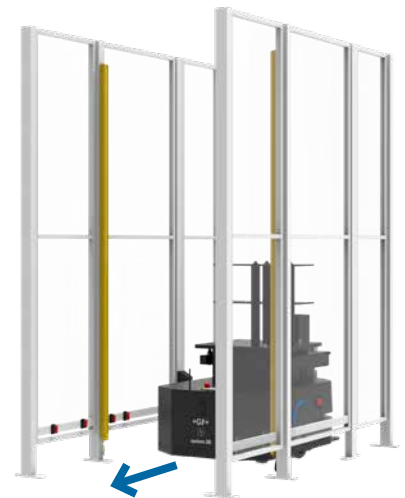
1

AMR stops outside cell and requests entry. AMR enters cell. Photosensors detect AMR and the light barrier is muted.



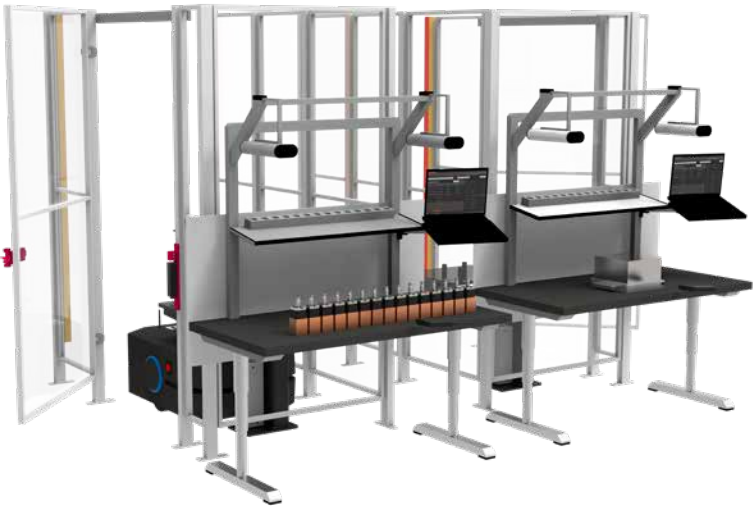
2

AMR in final position and the home sensor is activated to verify correct position. Lifting station can now load or unload tray.



3

AMR leaves cell and travels to next assignment.

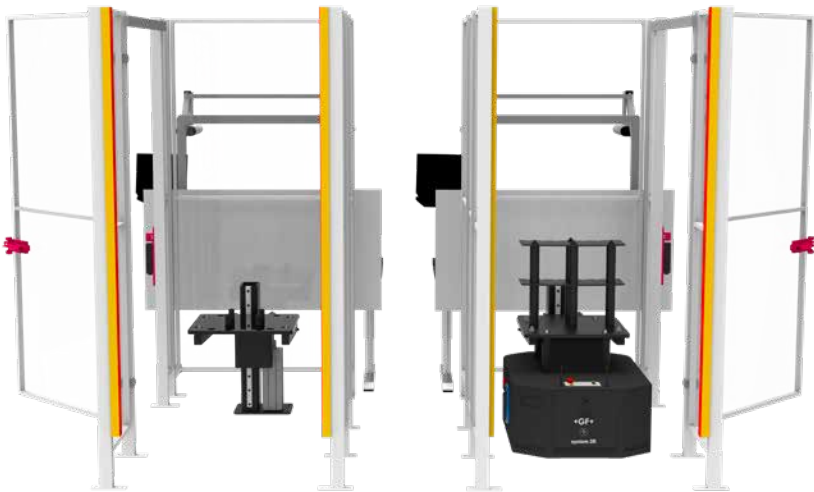


## Preparation stations

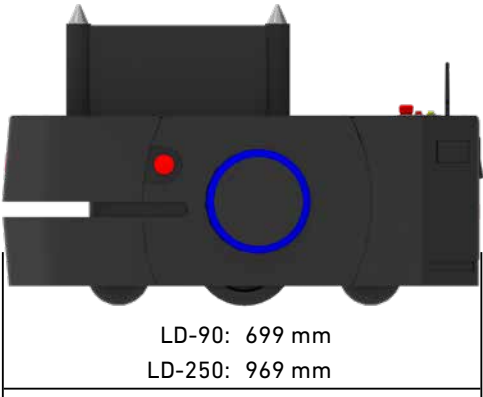
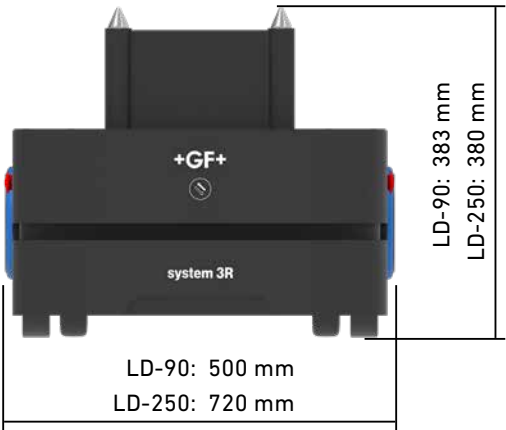
A preparation station is used to prepare a "job" with specific tooling on a trays. Here, Macro electrodes have been prepared.

## Parking stations

A parking station is used as a buffer for different tooling trays. When an AMR needs to change to another tooling system, it has to park its current tray somewhere. It can not be in the robotcell. It has to be a dedicated area. Unless only one AMR and one tray are used, there also has to be a minimum number of trays in the system.



# Technical specifications



|        | Handling weight (kg) | Max. speed (mm/s) | Unit weight Incl. battery (kg) | Wi-Fi | Safety laser scanner |
|--------|----------------------|-------------------|--------------------------------|-------|----------------------|
| Model  |                      |                   |                                |       |                      |
| LD-90  | 90                   | 1.350             | 62                             | Yes   | 270 degrees          |
| LD-250 | 250                  | 1.200             | 148                            | Yes   | 240 degrees          |



# Loading examples

## WorkPartner 1+ and AMR – Loading/unloading trays into/from a cell

AMR with tray and lifter at a loading/unloading station at one of the machine's sides (where 1 machining centre only)



AMR with tray and lifter at a loading/unloading station that has an automatic door on its magazine (support coming in 2024)





# Loading examples

Transformer 3-axis and AMR – Loading/unloading a cell



Transformer 3-axis: AMR with tray and lifter at a loading/unloading station.

# Loading examples

Transformer 6-axis and AMR – Loading/unloading a cell

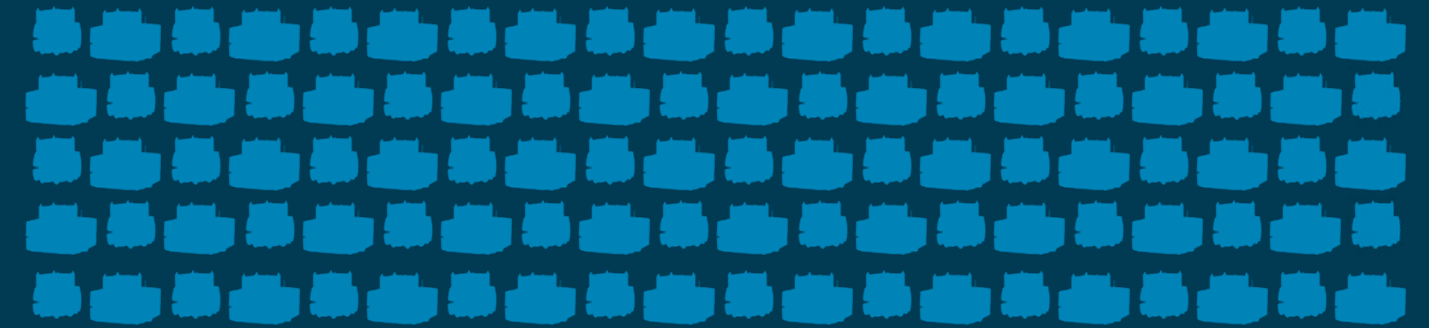


Transformer 6-axis: AMR with tray and lifter at a loading/unloading station.





# Powerful fleet management



Running with FLOW Core software, Fleet Manager can handle fleets of up to 100 robots in any configuration.



## **FLEET OPERATIONS WORKSPACE (FLOW) CORE**

The Fleet operations workspace (FLOW) solution provides an intelligent fleet management system that monitors mobile robot locations, traffic flow, and job requests, ensuring your factory operates at peak efficiency.

By automating robot tasks, our FLOW Core solution also reduces programming in your manufacturing execution system (MES) or enterprise resource planning (ERP) system.

- Displays robot location and status
- Displays job queue
- Prioritises important jobs
- Selects fastest routes based on human and robot traffic
- Identifies blocked paths and creates alternative routes
- Optimises job assignments
- Optimises battery charging

up to **100 AMRs**

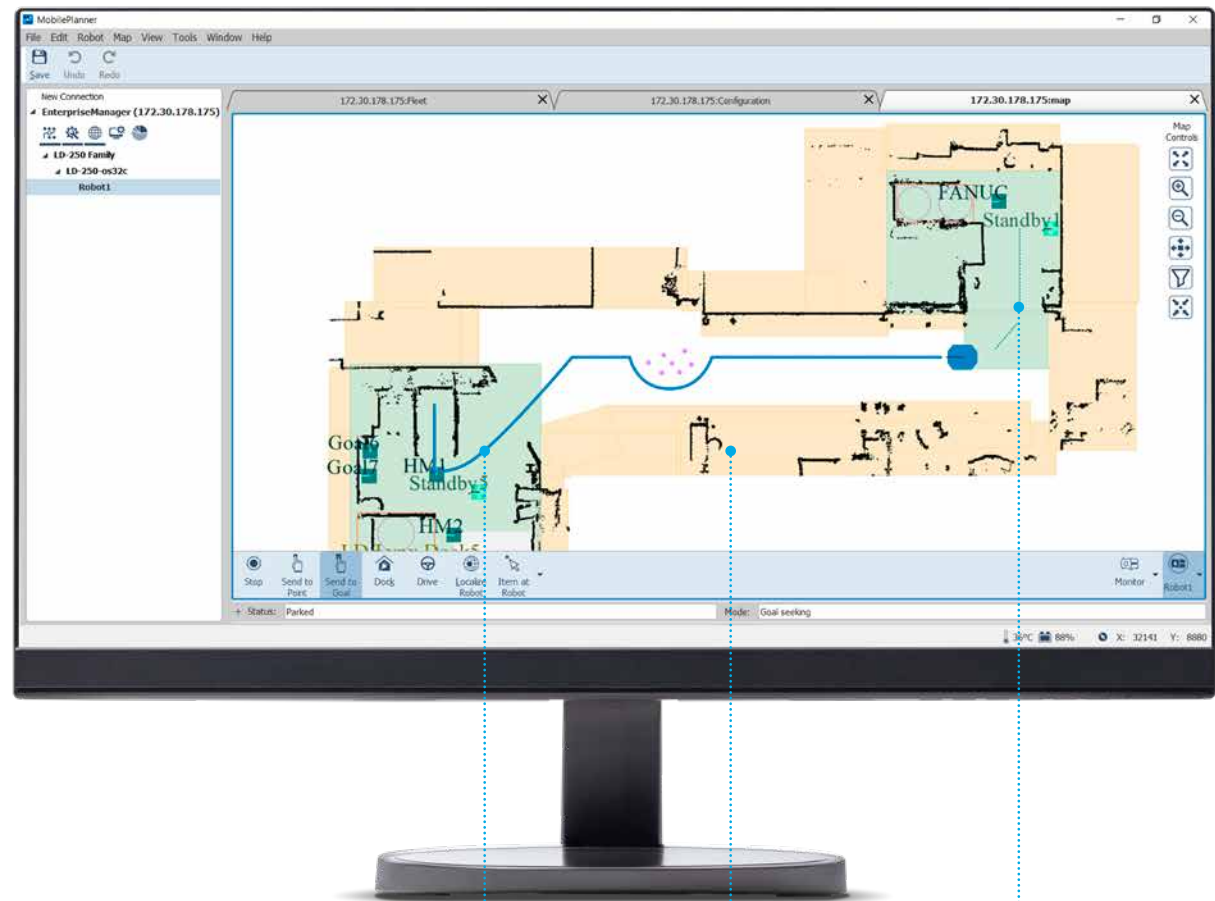


# Communication and planning

## You can run up to 100 AMRs

Every robot in the fleet acts as a sensor mapping out even the most challenging environments and optimising performance. This includes everything from navigating tight aisles to planning the most efficient routes.

- Dynamic obstacle avoidance
- Faster navigation times
- Smoother driving
- Fast goal (destination) approach speeds
- Superior alignment at goals



To create a digital map, an AMR can scan the factory floor.

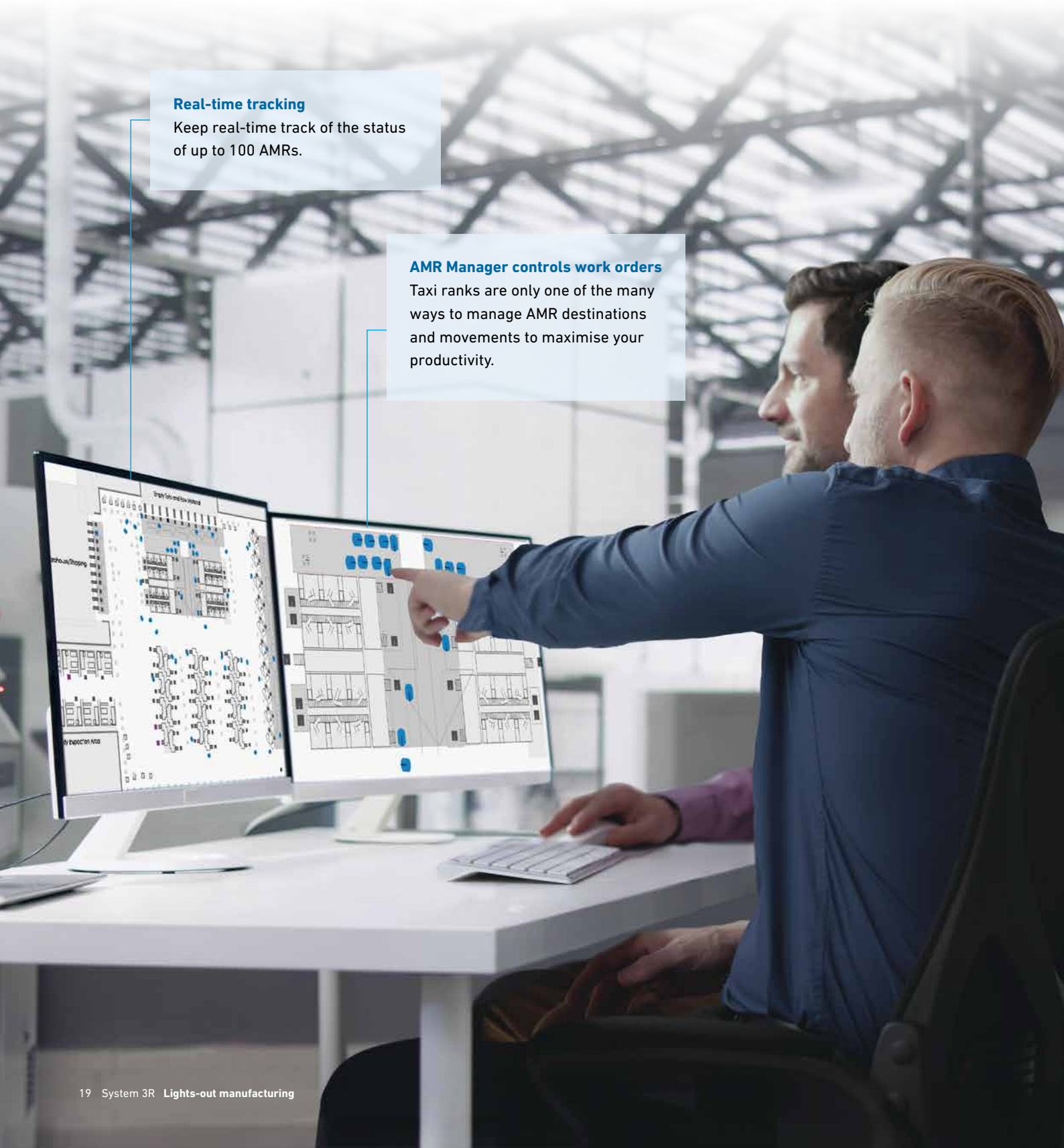
1. speed zones (green areas)
2. forbidden zones (orange/beige areas)
3. preferred route (green dotted line)

## Configure the AMR's operating parameters to control the operation

For example

1. Speed zones (green areas)
2. Forbidden zones (orange/beige areas)
3. Preferred route (green dotted line)

**AMR Manager**  
Communicates with AMRs and cells.



## Real-time tracking

Keep real-time track of the status of up to 100 AMRs.

## AMR Manager controls work orders

Taxi ranks are only one of the many ways to manage AMR destinations and movements to maximise your productivity.



WorkShopManager 5

# WSM 5

The future-proof software enabling you to step into lights-out manufacturing

- Easy to use
- ERP interface (import/export)
- Production scheduling and monitoring
- AMR ready
- Cutting tool management
- Cell OEE and Dashboards
- OPC-UA compatible

## How WSM 5 gives you a lights-out advantage

- Multi-technology
- Scalable
- Reduced error rates
- Material management efficiencies
- Agility and flexibility to meet changing demands
- Accelerated product switching
- Manned/unmanned compatibility
- Faster replication of processes at new sites



# Fully Autonomous Mobile Robots

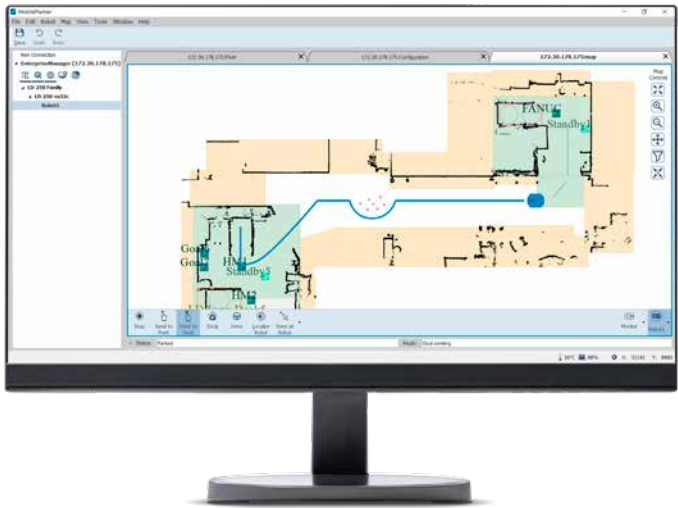
System 3R has chosen OMRON as its partner for AMRs. These latter are designed to dramatically increase productivity in manufacturing and logistics operations. OMRON's AMRs increase throughput, eliminate errors, improve material traceability and enable employees to focus on tasks that require complex human skills.

They fit perfectly into both System 3R's transport-centred concept (pallets, electrodes, cutting tools and raw materials) and System 3R's range of robot solutions.



# Factory optimisation with best-in-class fleet management

Managers are under constant pressure to meet a variety of improvement goals for their factories. The OMRON fleet management solution is tailored to ensure best-in-class fleet management. To optimise performance of the robot fleet and the entire factory, it provides in-built data capture, analytics and reporting. WSM 5 masterminds which AMRs are to send what, and when, to the different factory cells or machines.



# AMRs versus automatic guided vehicles (AGVs)

Unlike AMRs, AGVs require guides. These restrict routing options.



## System 3R's AMR solutions

|                      |  |
|----------------------|--|
| Set-up               | Ready to go after simple mapping                         |
| Navigation           | Navigate autonomously and safely without physical guides |
| Obstacles            | Safely avoid obstacles without stopping                  |
| Map changes          | Easy   |
| Destinations changes | Easy   |
| Scalability          | Easy   |



**AMR**  
AMRs calculate new routes around obstacles (e.g. a person).

## AGVs

|                      |   |
|----------------------|---|
| Set-up               | Require navigation guides                               |
| Navigation           | Need guides such as floor magnets or beacons            |
| Obstacles            | Stop and wait when there is an obstacle (e.g. a person) |
| Map changes          | Factory modification                                    |
| Destinations changes | Factory modification                                    |
| Scalability          | Factory modification                                    |



**AGVs**  
Stop and wait when there is an obstacle (e.g. a person).



# At a glance

We enable our customers to run their businesses efficiently and effectively by offering innovative Milling, EDM, Laser, Additive Manufacturing, Spindle, Tooling and Automation solutions. A comprehensive package of services completes our proposition.

[www.gfms.com](http://www.gfms.com)

