# Six steps to your Automated Guided Vehicle System.

**Enhance the efficiency of your internal transport tasks.**

JUNGHEINRICH

# At your side, every step of the way.

**Automation in safe hands**

Consistent, recurring internal transport tasks are ideally suited for automation. By using our Automated Guided Vehicle Systems (AGVS), you not only relieve the workload on your employees, which you can then deploy more effectively in other areas. You also lay the foundation for enhanced efficiency and optimized processes.

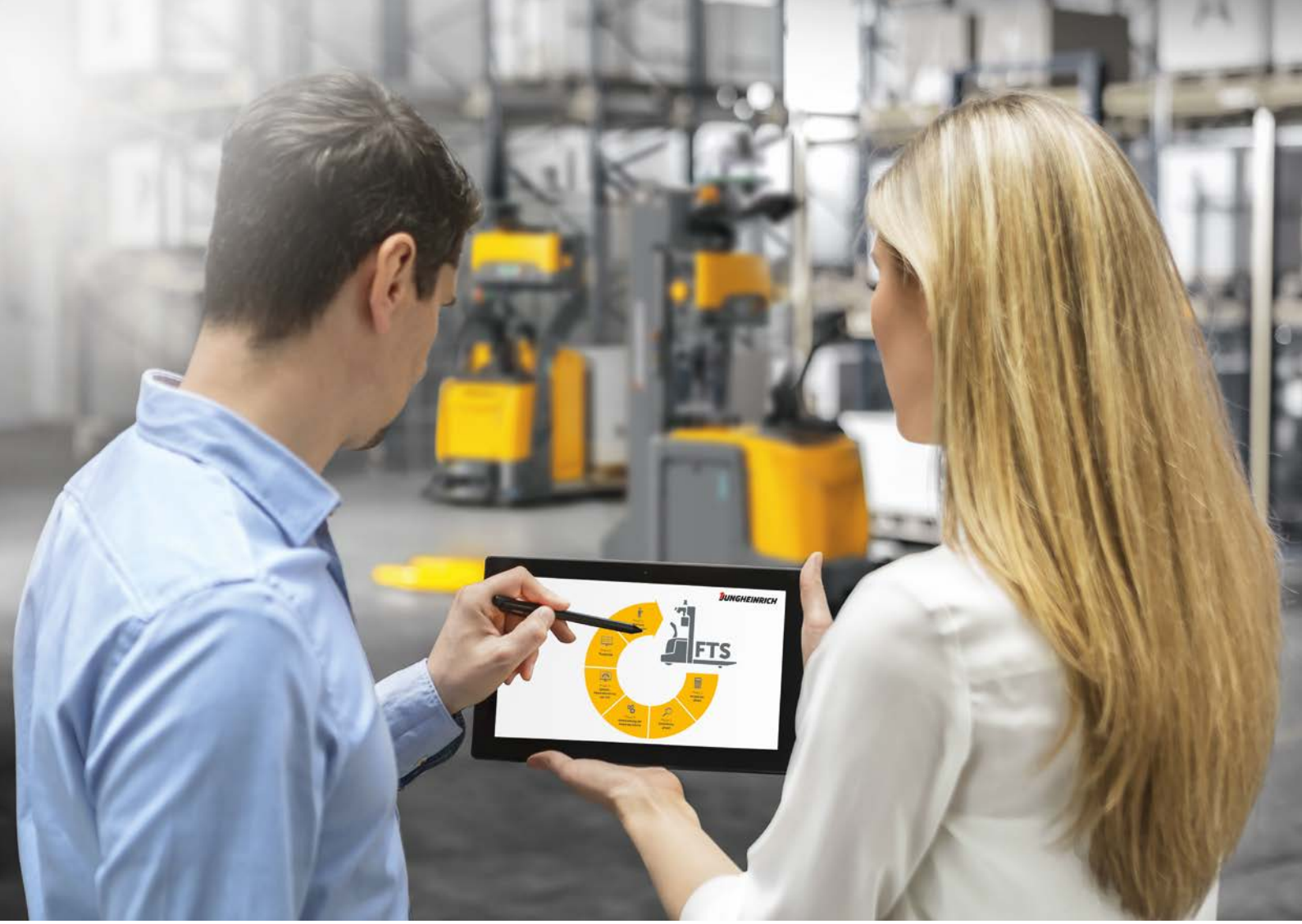
Jungheinrich is your perfect partner for the planning and implementation of Automated Guided Vehicle Systems, as we deliver everything from a single source: The automated vehicles are part of our own series production and we install the automation components ourselves. Our specialists boast many years of experience and have already built numerous automated systems. With reliable support, one of the most comprehensive service networks in the industry and a rapid spare parts supply, we offer utmost security throughout the entire service life of your system. All this ensures a carefree experience for you – from the planning phase to the implementation and service.

**Your benefits with our Automated Guided Vehicle System:**

- Individual adaptation to your tasks and environment
- Simple integration into existing processes and systems
- High safety levels thanks to a comprehensive vehicle safety system
- Reliable transport with precise navigation
- High flexibility with regard to layout changes
- Process reliability thanks to consistent performance
- No damage to transported goods and peripherals thanks to extensive safety sensors

## How we develop your project:

**01 Proposal phase** → **02 Definition phase** → **03 Preparation for implementation**




### Success in six phases

When we tackle a project, we proceed according to a tried and tested system. This is structured into six phases, which we will go into in more detail on the following pages. You will see that we have thought of everything and have ensured transparency and clarity for you in every step. You can rely on us as your automation partner. We never lose sight of the overall process and the individual challenges it poses. We will talk to you as and when required by the project and are always happy to meet with you at your request. You can rest assured that we will always keep you up-to-date.

**04** On-site system implementation

**05** Commissioning phase

**06** Maintenance and support

# Your transport tasks under the microscope.

### Our way to a comprehensive proposal

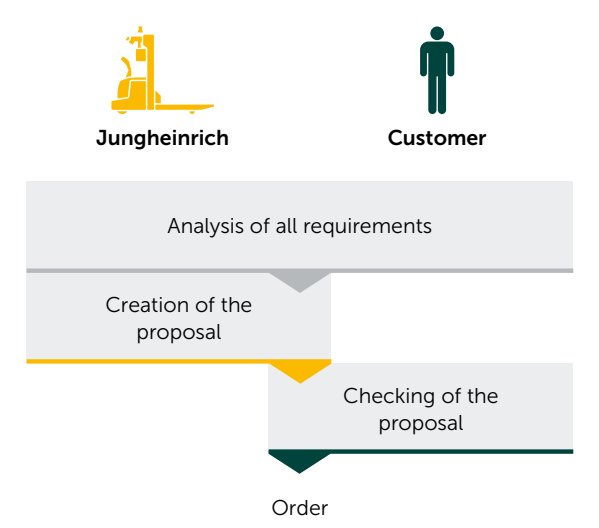
A detailed **analysis of your intralogistics requirements** serves as the foundation for our work. Based on your transport matrix, we will work with you to establish your required transport volume and assess the condition of your pick-up and drop-off points, also known as sources and destinations. What types of loads are to be transported and what loading aids are required or are already in use? What do your travel routes look like? Are there any special considerations, such as lifts, ramps or gates, to be taken into account?

Once we have obtained a detailed picture of these requirements, we will discuss your IT setup in order to address such matters as data exchange. We will establish, for example, whether a wireless network is in place, whether you are already working with a warehouse management system as well as which interfaces with your warehouse equipment are in place and thus need to be considered.

### Peripherals under control

Our Automated Guided Vehicle Systems can adapt to a wide range of spatial and technical conditions. These include:

- Various conveyor technologies
- Different racking systems
- Travelling in lifts
- Operation of pallet lifts
- Connection of gravity roller conveyors
- Communication with high-speed and fire protection doors




**01 Proposal phase** 02 03 04 05 06

### You set us in motion

Based on the information that you have provided and the data we have collected, we then **create our proposal**. We will recommend suitable automated vehicle types, along with a charging concept tailored to the number, type and operating times of the Automated Guided Vehicles (AGV). Our proposal will also take into account the various peripheral parameters. For example, we will include the necessary signal units such as buttons and terminals for any conveyor technology as well as the I/O boxes that communicate with external controllers for doors, sensors etc.

All the while, you retain utmost flexibility: The automated vehicles can be implemented as a standalone system or integrated in your warehouse management system via our middleware. The connection to our own Jungheinrich Warehouse Management System or via SAP EWM is also standardized, meaning that you benefit from rapid, straightforward integration.

We will discuss every part of our proposal with you. After you have **checked the proposal**, we can incorporate any changes you require by making suitable adjustments. Once we have established an optimum solution to suit all parties, you are free to place your **order** and thus initiate the second stage – that is, the definition phase.

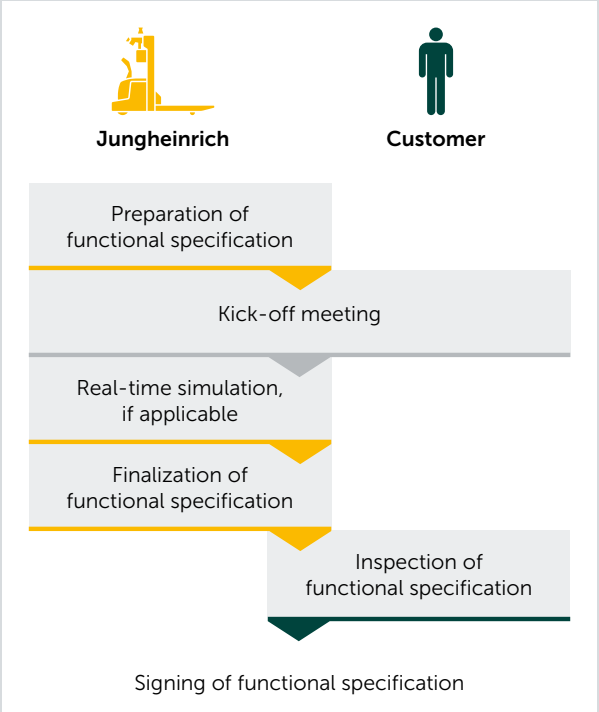
**Your benefits in the proposal phase:**

- Complete survey of your intralogistics processes
- Complete planning of your intralogistics requirements
- Accurate assessment of your IT interfaces
- Detailed, easily comprehensible proposal
- Inclusion of all change requests prior to order submission

# What, where and when?

### Definition of your processes

With the **preparation of a functional specification**, we create the foundation for all technical processes and scheduling of your project. At the same time, the functional specification defines our scope of supply and services. This ensures utmost transparency at all times over who will deliver what and when. Once all aspects have been discussed and any necessary changes incorporated, we will review the final version of the functional specification together during a **kick-off meeting**.




01 **02 Definition phase** 03 04 05 06


### Individual real-time simulation

Depending on the complexity of your future automated system, it can be useful to factor in a **real-time simulation**. Based on your supplied CAD data of your warehouse, we will create a layout of the virtual travel routes using a special program. We will program the coordinating control on the basis of your transport matrix. The predicted traffic flow and transport performance of the automated system are also included in the simulation. In addition, the individual vehicle properties are taken into account along with the visited stations and battery charging processes. The real-time simulation can also be used to check borderline situations such as performance peaks.

You can also commission a real-time simulation from our specialists regardless of any later implementation, thus allowing you to assess the deployment of our Automated Guided Vehicle System in your company. This provides you with an important decision-making basis and offers additional flexibility when it comes to awarding the contract for the final system.

If your project requires a real-time simulation, this will be included in the functional specification. Upon **finalization of the functional specification**, it will be sent to you for **inspection**. Once you have **signed the specification**, this signals the transition to phase 3 – preparation for implementation.

**Your benefits in the definition phase:**

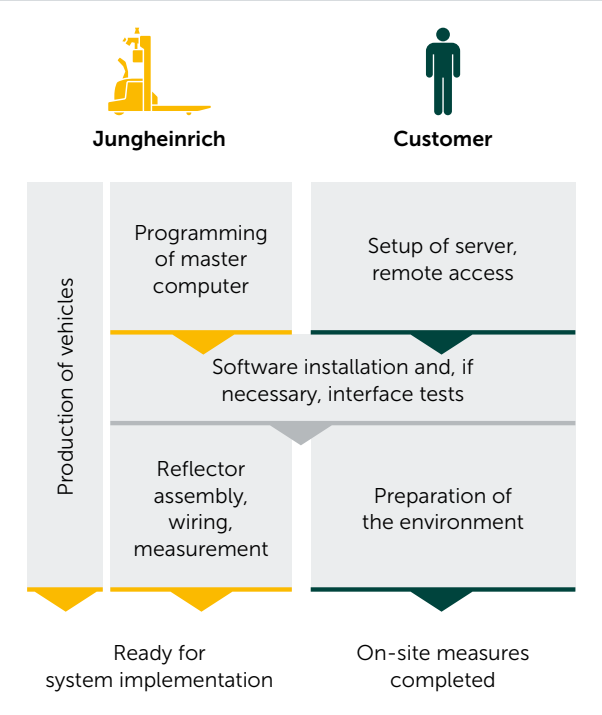
- Clear task definition in functional specification
- Real-time simulation on request, also available separately
- Final functional specification as basis for your project

# Preparation of your hardware and software.

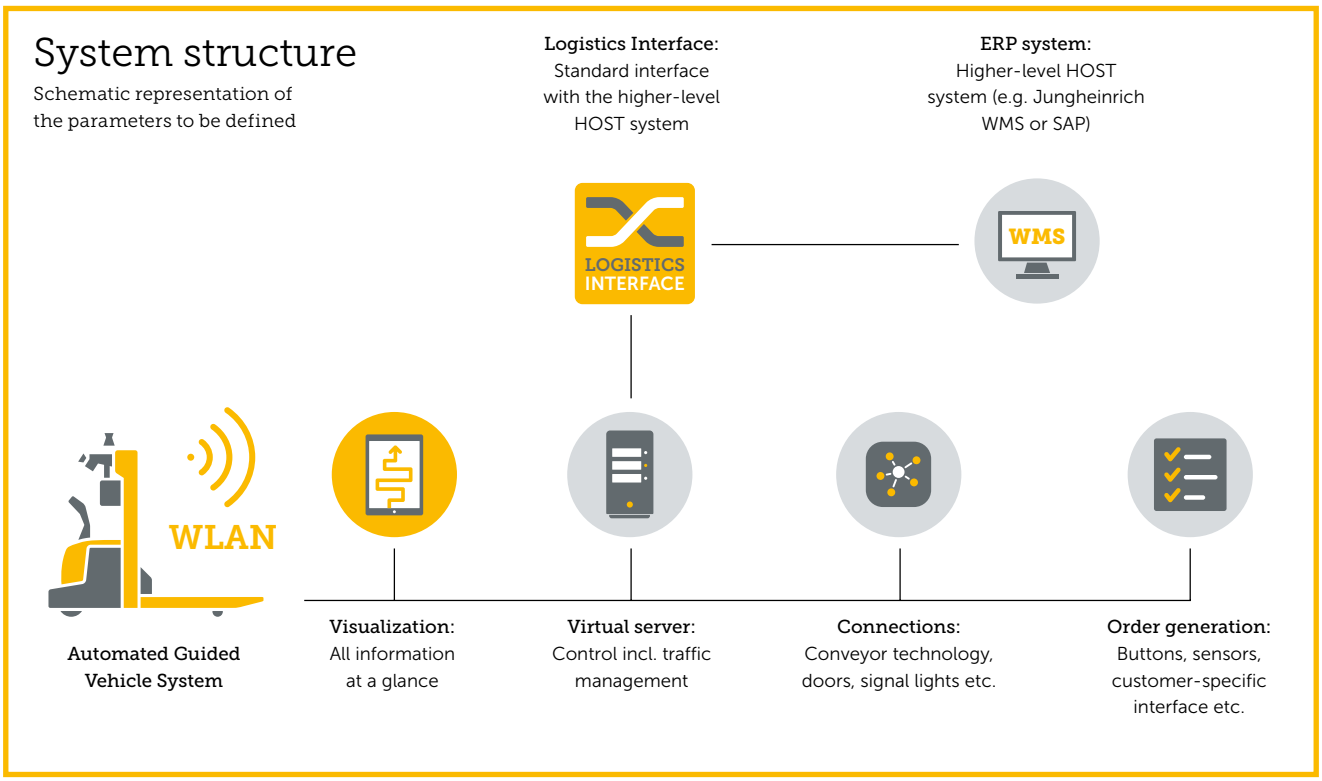
### Individual production and programming

When it comes to the **production of your vehicles**, you can count on the experience of one of the world's leading providers of intralogistics vehicles and complete solutions. All forklift trucks, tow tractors and pallet trucks, which we convert into Automated Guided Vehicles, are based on our tried and tested series production vehicles. Once we have received your order, we will construct your vehicles on the relevant lines and equip them with the automatic kit and comprehensive safety system. After being subjected to extensive testing, the AGVs will then be ready for use.

At the same time, we will start with the setup and installation of all necessary programs. Using a virtual **server**, which will generally be part of your IT landscape, we will conduct the individual or prepared **programming of the master computer** and the necessary PLC interfaces. Thanks to **remote access**, we can test the function of the I/O boxes, which are used to control the peripheral technology, at your site prior to installation.




01 02 **03 Preparation for implementation** 04 05 06




### On-site installation and integration

In the next step, we install the signal units and I/O boxes in your warehouse. Based on practical experience, we recommend that the **preparation of the environment**, such as the electrical **wiring**, be completed by your in-house technicians, as they are more familiar with the local conditions. Depending on the environment, our fitters will install the **reflectors** for the AGV laser navigation or simply stick them in place. One major advantage: there is no need for conversion work in your warehouse.

Upon **completion of all on-site measures**, the entire navigation environment is measured out, whilst any necessary adjustments are made for the route layout. On the software side, we will complete the network integration and ensure that communication functions flawlessly. The preparatory work is then concluded with a practical test of all interfaces. Only when everything is working without issue will the automated vehicles be delivered to your warehouse, which means we will be ready for phase 4 – **on-site implementation.**

**Your benefits during preparation for implementation:**

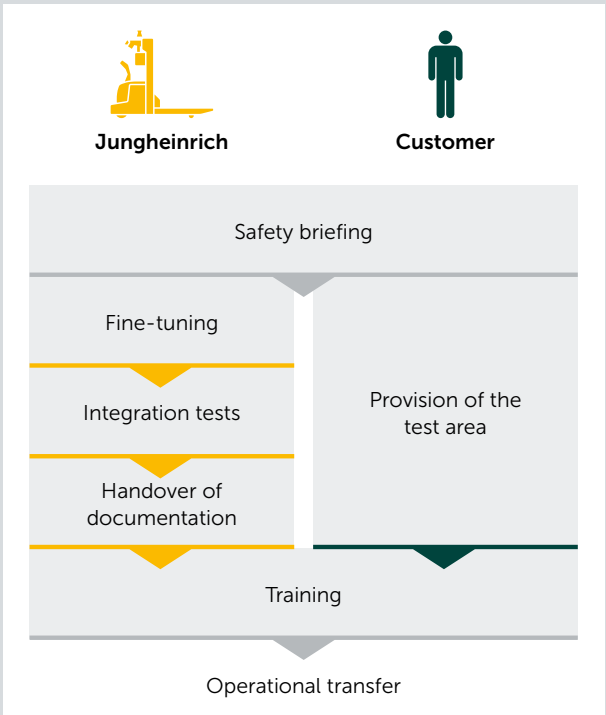
- Your AGVs are based on tried and tested series production vehicles
- Interface tests are conducted remotely in advance to shorten the implementation time and address any problems at an early stage
- Laser navigation removes the need for ground work
- Delivery shortly before start of operation minimizes risk of damage to vehicles and potential disruption to established workflows

# Ready to go.

**Your employees are familiarized with the Automated Guided Vehicle System**

We will deliver special training to your operators and key users. The latter are to be enabled to impart their knowledge to new employees. Once your employees are familiar with such matters as troubleshooting, vehicle engagement and charging, they will largely be able to work independently. This ensures that your processes run reliably and without problems.

Since our AGVs are generally suitable for mixed operation with manual trucks and pedestrians, all of your employees should get to know their new "colleagues". For this purpose, we will deliver a **safety briefing** to demonstrate the functions and diverse safety features of the automated vehicles.




01 02 03 **04 On-site system implementation** 05 06

### Fine-tuning during live operation

For the next steps, you will have provided us with a **test area**. Directly after delivery, we will check the functionality of the automated vehicles and make neccessary **fine-tuning**. We will then test whether the AGVs follow the optimum routes on the programmed travel paths. Our technicians will walk alongside the vehicle, record any deviations and then correct them in the layout program. As a further benefit, you will always be supported by the same contact person, who will handle everything from implementation to service.

Following the successful **integration tests** of connected conveyor technology, lifts, high-speed doors etc., your customer-specific **documentation** will be completed and handed over. Throughout this process, particular attention will be paid to safety-relevant matters, which will also be covered separately in a dedicated **training course**. The next step will then be to **hand over the operational system**. Responsibility will transfer to you and we will enter phase 5 – that is, the test phase.

**Your benefits during on-site implementation:**

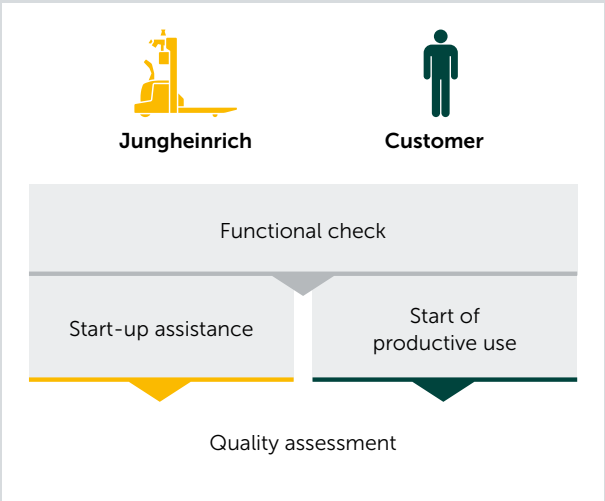
- Individual employee training
- Safety briefing for all relevant parties to ensure smooth integration of the AGVs
- Operational reliability thanks to fine-tuning and integration tests
- Complete documentation is transparent and easy to understand

# Your automated vehicles assume operation.

**By your side from the start**

When your automated system goes live, this represents a turning point in the execution of your intralogistics processes. We are well aware of this situation, and you can rest assured that you will not be left alone. Throughout this phase, we will provide **start-up assistance** to your operators and relevant employees, we will be available for all your questions and will rectify any problems directly on-site.

During their on-the-job training, your employees will discover and embrace the advantages and possibilities offered by our Automated Guided Vehicles. Our aim is to dispel any fears and demonstrate that the interaction between man and machine is a smooth, problem-free process and makes everyday work a great deal easier. The commissioning phase will conclude with a quality assessment of your automated system.




01 02 03 04 **05 Commissioning** 06


### We are here to help

Complex systems involving different vehicles, various conveyor technology and intricate travel routes with lifts or other obstacles often result in numerous questions from those employees working with the newly automated system. In such cases, you can choose to arrange **individual support** during the **start of productive operation**.

### Tailored support

During the commissioning phase, you can benefit from different types of assistance. You can arrange a specific level of support during the test phase:
Remote support: Our specialists will check your system from their offices and provide support where necessary.
Customer service support: A service engineer will be on-site for a specific period or on a full-time basis to deliver immediate assistance.
Specialist support: Our AGV specialists will be on-site to answer all your questions.

After the commissioning phase, we come to the final phase of the project – that is, our diverse range of maintenance and support services.

**Your benefits during commissioning:**

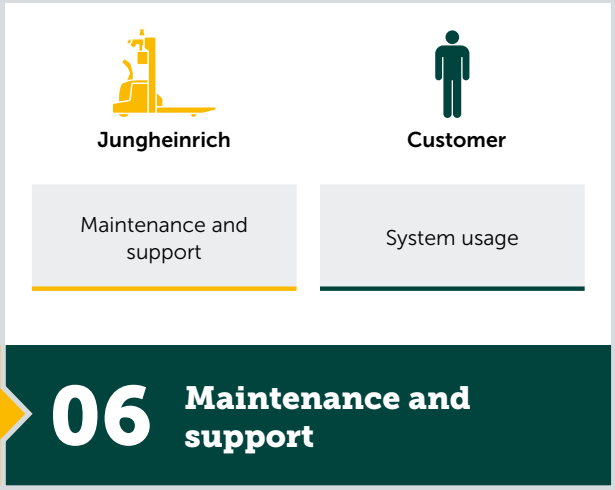
- On-site start-up assistance
- Seamless transition to productive operation
- Tailored level of support

# We offer security.

**Our service**

If you opt for our service, you will always be on the safe side. With more than 4,500 Jungheinrich service engineers across the globe, we have one of the most extensive service networks in the industry. Be it preventive **maintenance** against failures, annual accident-prevention inspections, repairs or full-service agreements for a complete carefree package – with us, you are always in good hands.

In the case of a fault, you will be assisted by Jungheinrich technicians in your area. Our service engineers have not only completed special training in the area of system trucks, they are also highly familiar with your AGV system, as they will already have supported its implementation. As a further benefit, spare parts availability of 98 % reduces downtimes to an absolute minimum.



### 24/7 support

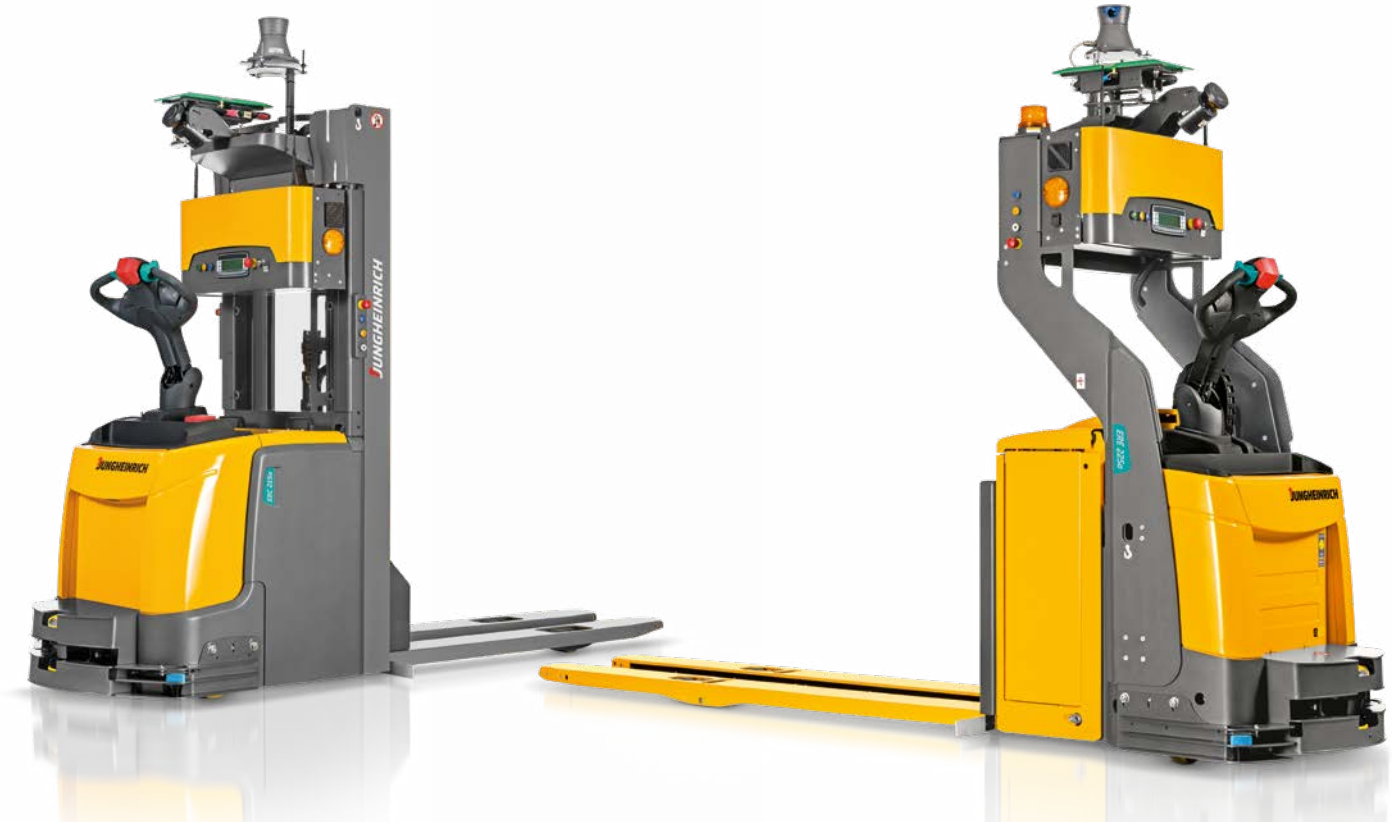
Our **support** staff are your first port of call in the case of faults or general questions on **using your system**. All of our support workers have extensive experience and will be able to solve the majority of issues directly via remote access. If this is not possible, our support team will immediately contact a local service engineer – at Jungheinrich, service and support work hand-in-hand.

Depending on your individual requirements, you can choose between different support levels. We can accommodate all needs – be it 8 hours a day on 5 days a week or round-the-clock support 365 days a year.

**Your service benefits:**

- Extensive service network, rapid availability
- Same contacts as during implementation
- Individually configurable support scope
- 24/7 hotline and remote access possible

# Tried and tested.
# Our Automated Guided Vehicles.




**ERC 215a – stacker truck**
**Lift height: up to 4,000 mm**
**Capacity: up to 1,500 kg**
**Features:** Highly maneuverable AGV, suitable for standardized loading aids and drive-under stations.

**ERE 225a – pallet truck**
**Fork length: up to 2,400 mm**
**Capacity: up to 2,500 kg**
**Features:** Powerful AGV, suitable for standardized loading aids, multi-pallet transport and long distances.



**EZS 350a – tow tractor**
**Towing capacity: up to 5,000 kg**
**Features:** Robust towing truck, suitable for towing multiple trailers, compact dimensions for use in narrow aisles.

**EKS 215a – cantilevered truck**
**Lift height: up to 6,000 mm**
**Capacity: 1,500 kg**
**Features:** Versatile AGV, suitable for non-drive-under loading aids and stations

**Our Automated Guided Vehicles in action:**
http://www.jungheinrich.com/agv

# We deliver systematic service, round the clock.

Jungheinrich not only stands for quality and competence in the development and production of intralogistics system solutions. From the outset, our service philosophy has always been at the center of everything we do.

Uniform global quality standards, short paths to the customer and round-the-clock availability: Jungheinrich employees across the globe do everything to ensure problem-free operation of your logistics system and minimize the risk of downtimes.

Well above

**10 years**

spare parts availability

More than

**4,500**

in-house service engineers

operating across the globe, with an average of 11 years professional experience

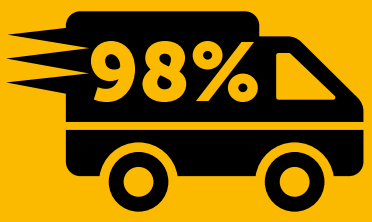
More than

**49,500**

years of experience

**More than 300 projects**

receiving service support

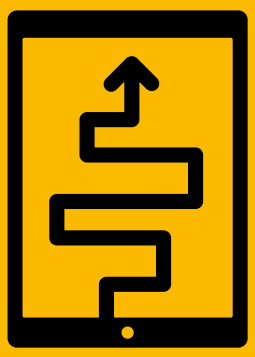



overnight delivery in Europe

More than

**15,000**

employees worldwide



Latest visualization software

Sophisticated diagnostic tools

**24/7** service and support on **365** days a year


own sales and service companies in Europe, Asia, South America and Australia

ISO 9001
ISO 14001

The German production facilities in Norderstedt, Moosburg and Landsberg are certified.

CE

Jungheinrich trucks conform to the European Safety Requirements.

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