

Six steps to your Automated Guided Vehicle System

Enhance the efficiency of your
internal transport tasks.

 **JUNGHEINRICH®**



1

Proposal
phase

2

Definition
phase

3

Preparation for
implementation

4

On-site
implementation

5

Commissioning
phase

6

Maintenance
and support

By 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 can provide the foundation for enhanced efficiency and optimized processes. This foundation allows for reallocation of employee workload and ability to deploy effectively in other areas.

Industry leading technology, desirable performance and a high level of safety is why Jungheinrich is your perfect partner for the planning and implementation of AGVS. We deliver everything from a single source: The AGVS are part of our series production, and we install the automation components ourselves.

Our specialists have many years of experience that include building a variety of AGVS. With reliable support, one of the most comprehensive service networks in the industry and a rapid spare parts supply, we can offer peace of mind 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 concerning layout changes
- Process reliability thanks to consistent performance
- Thanks to the extensive array of safety sensors, products are transported with care

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 system consists of six phases, which will be explained further. As your automation partner, we are dedicated to ensuring transparency and clarity for you in every step.

We never lose sight of the overall process and the individual challenges it poses. We will talk throughout the project, and 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. We will verify information such as types of loads that are being transported, loading aid requirements, travel route descriptions, and if there are any special considerations, such as lifts, ramps or gates, to be taken into account.

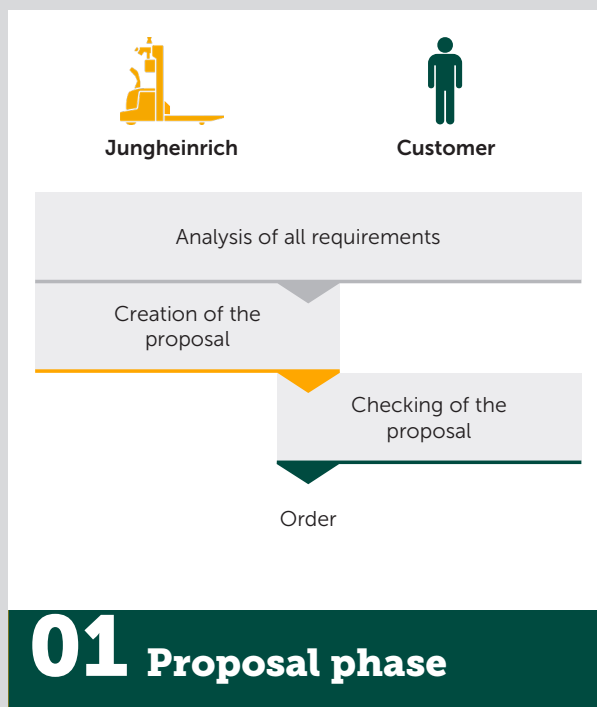
Once we have obtained a detailed picture of these requirements, we will discuss your IT setup to address such matters as data exchange. We will establish, for example, whether a wireless network is in place, whether you are already working with a warehouse management system and which system interface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

Peripherals under control

Our Automated Guided Vehicle Systems can adapt to a wide range of conditions.

These include:

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





Getting started

Based on the information that you provide and the data we collect, we then create our proposal. We will recommend a suitable AGVS, along with a charging concept tailored to the number, type and operating times of the AGVS. Our proposal will also consider 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 excellent flexibility: the AGVS can be implemented as a standalone system or integrated with 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.

Proposal process

Automation requires good insight into your business, processes and requirements. We will leverage your business insight to craft and propose the right solution for success.

We will walk you through the proposal to ensure it's correctly configured to meet your needs. 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:

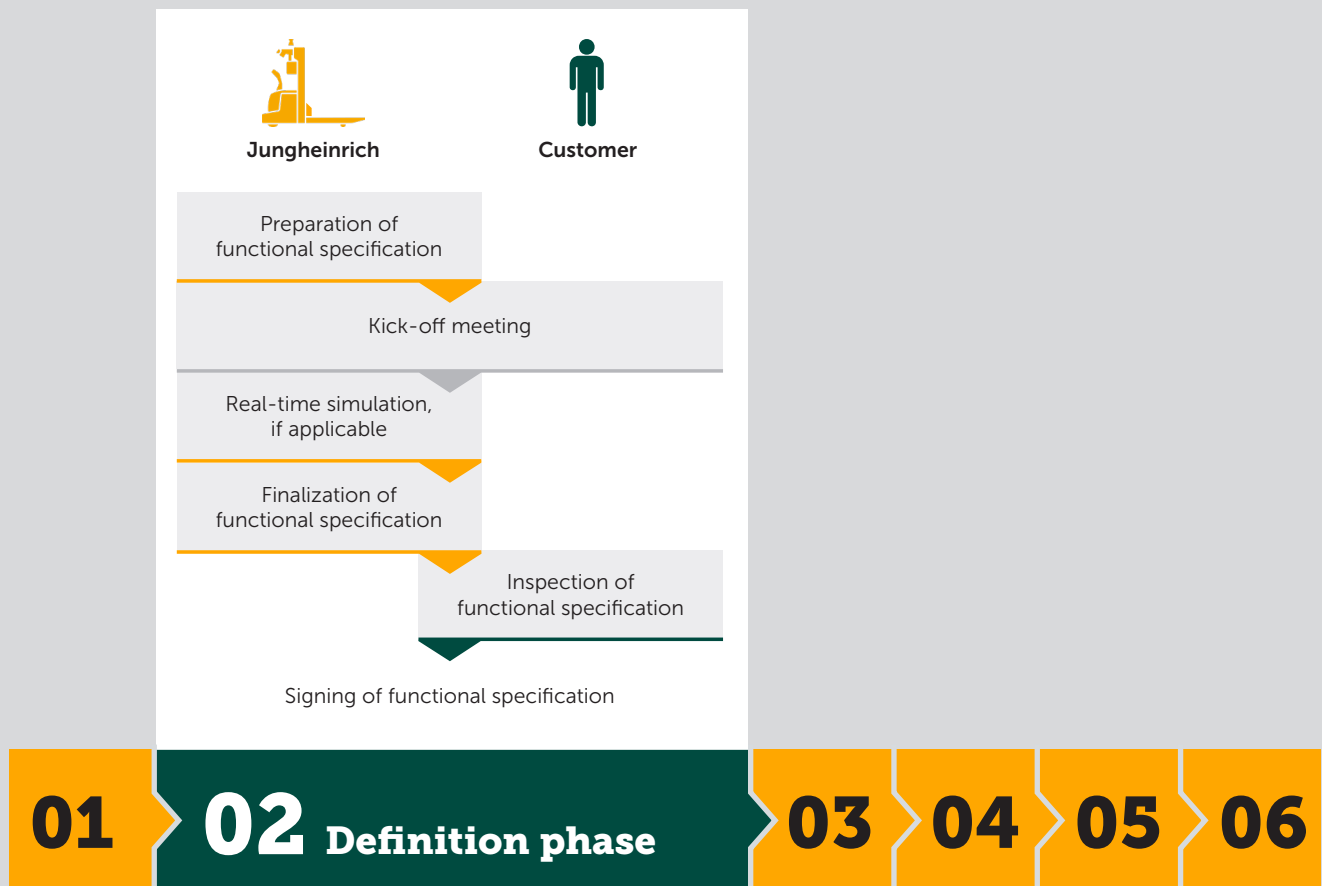
- Complete survey of your intralogistics processes
- Complete planning of your intralogistics requirements
- Accurate assessment of your IT interfaces
- Detailed, easily comprehensible proposal
- Inclusion of all change requests prior to order submission

What, where and when?

Definition of your processes

With the preparation of a functional specification, we construct the foundation for all technical processes and scheduling of your project. The functional specification defines our scope of supply and services.

Accountability will always be ensured in relation to 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.





Individual real-time simulation

Depending on the complexity of your future AGVS, it can be useful to factor in a real-time simulation. Based on the supplied computer-aided design (CAD) data of your warehouse, we will create a layout of the virtual travel routes using a particular program. We will program the coordinating control from your transport matrix. The predicted traffic flow and transport performance is 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 AGVS into your company. This provides you with a vital 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:

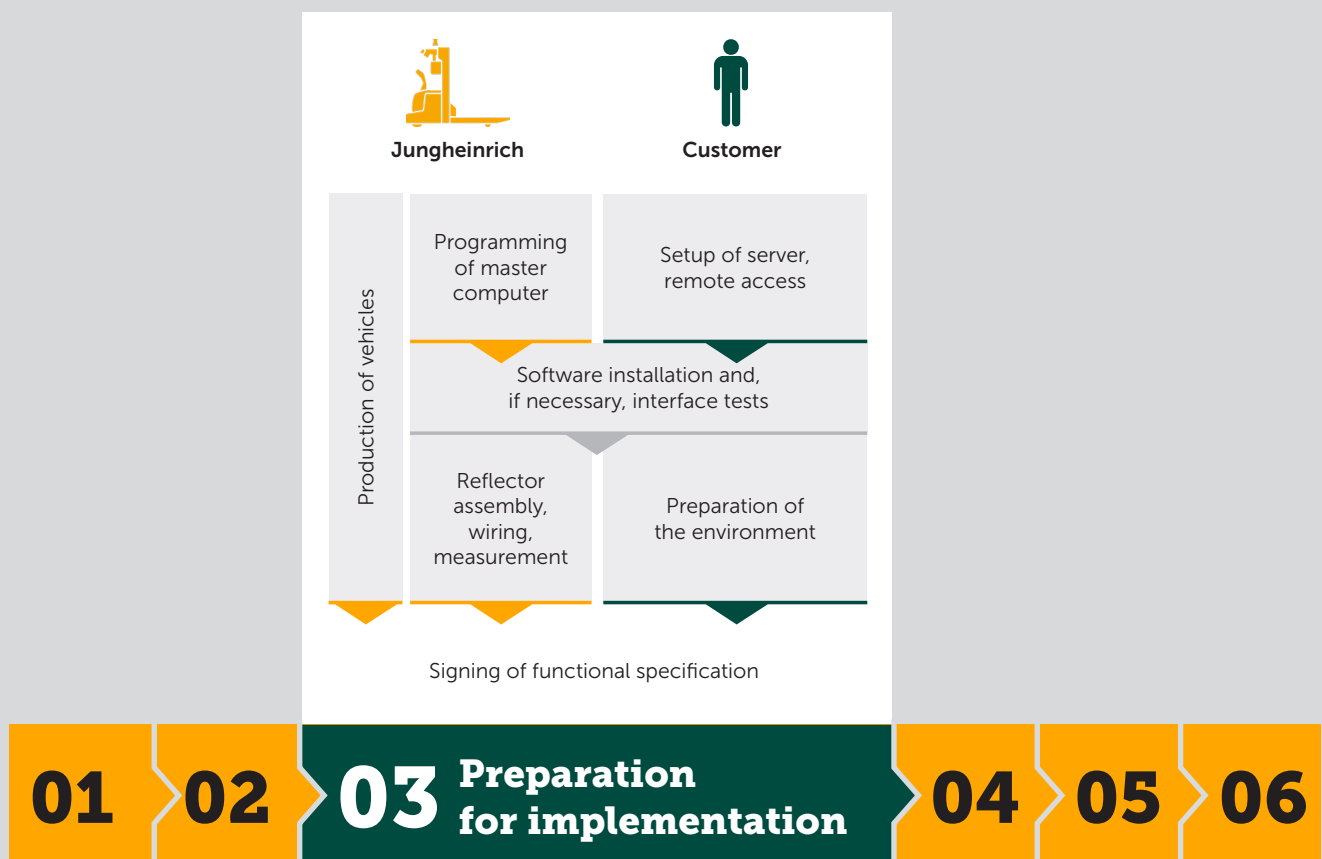
- Clear task definition in functional specification
- Real-time simulation on request, also available separately
- Final functional specification as a basis for your project

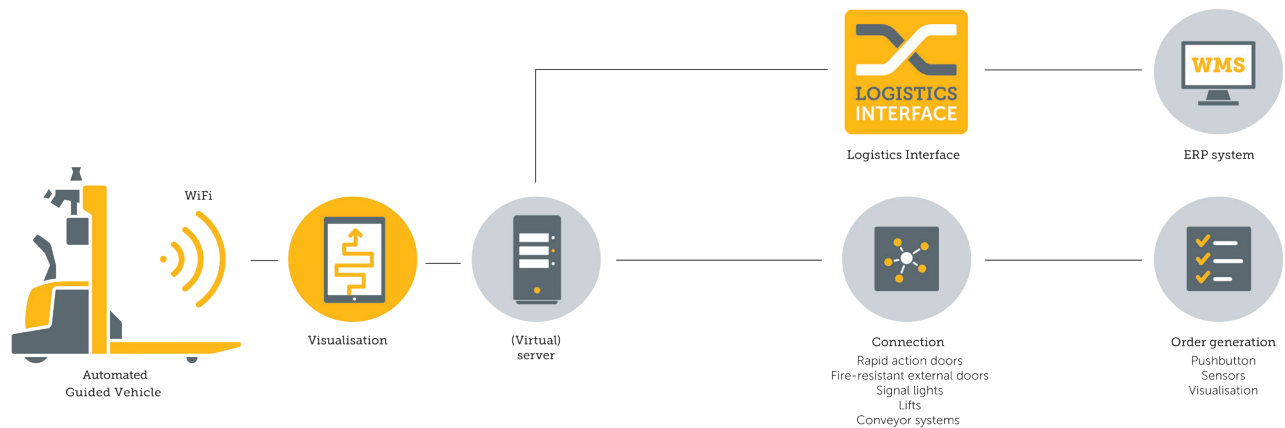
Preparation of your hardware and software.

Individual production and programming

When it comes to the production of your vehicles, you can count on Jungheinrich's experience as 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 AGVS, are based on our 55+ years of design experience in series production vehicles. Once we have received your order, we will construct your vehicles on the relevant lines and equip them with the electronic 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 information technology (IT) landscape, we will conduct the individual or prepared programming of the master computer and the necessary programmable logic controller (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 before installation.





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 inhouse technicians, as they are more familiar with the local conditions. Depending on the environment, our fitters will install the reflectors for the AGVS laser navigation or stick them in place. One significant 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, while 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 AGVS be delivered to your warehouse, which means we will be ready for phase 4 – on-site implementation.

Your benefits during preparation for implementation:

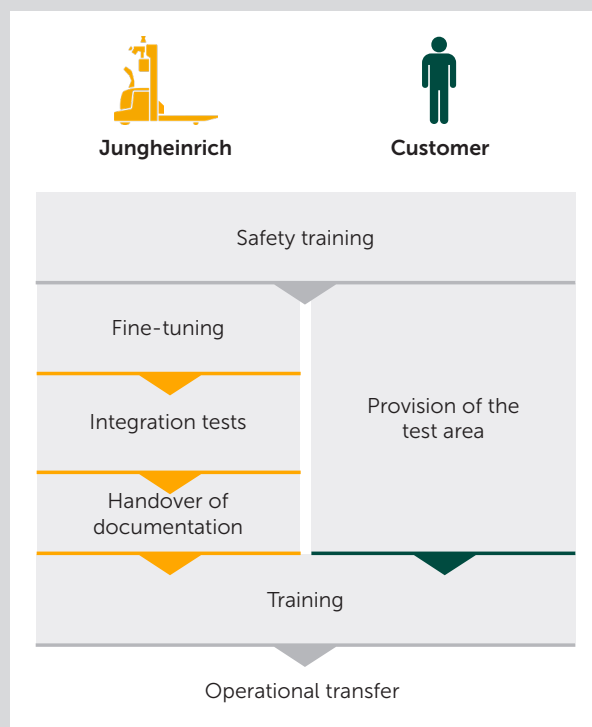
- AGVS are based on tried and tested series production vehicles
- Interface tests are conducted remotely in advance to shorten the implementation time and address any problems at an early stage
- Laser navigation provides flexibility and precise information about the vehicle's absolute position
- Delivery 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 specialized training to your operators and key users. Once your employees are familiar with troubleshooting operations, vehicle engagement, and charging, they will primarily 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 various safety features of the AGVS.



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 AGVS and make necessary 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 transferred. Throughout this process, attention will be paid to safety-relevant matters, which will also be covered separately in a dedicated training course. The next step includes handing over the operating system and then beginning phase 5 - the test phase.

Your benefits during on-site implementation:

- Individual employee training
- Safety training 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

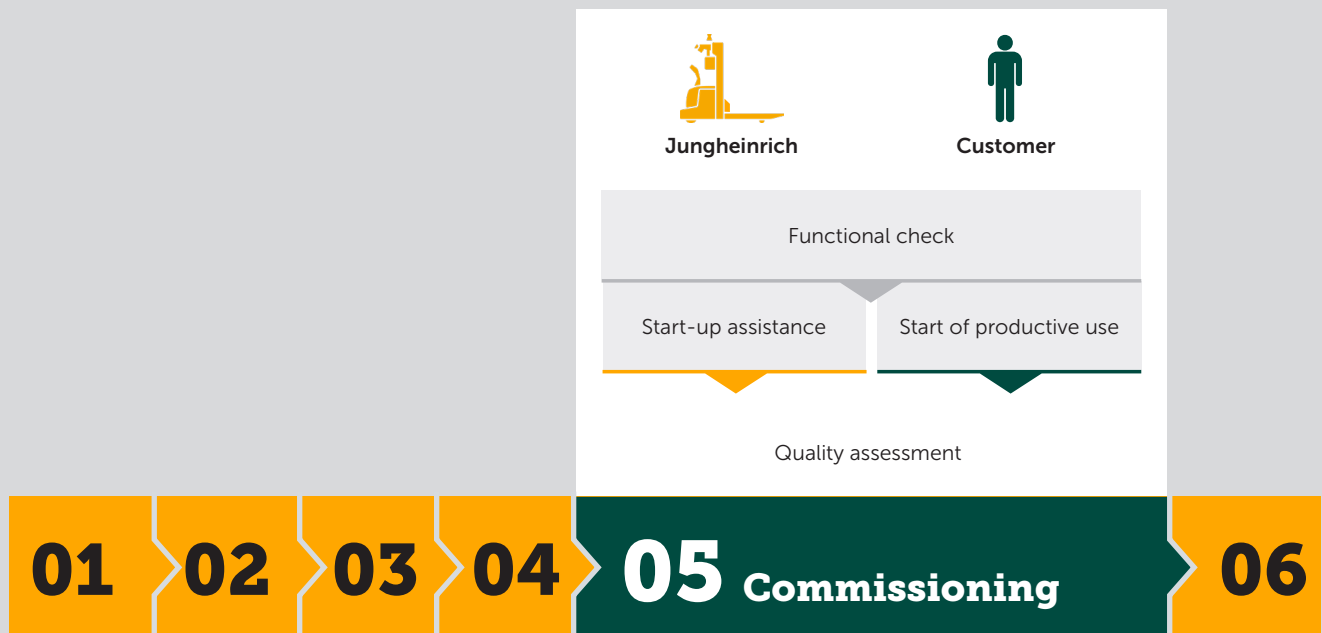


Your Automated Guided Vehicle Systems assume operation.

By your side from the start

When your AGVS 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 AGVS. We aim to dispel any concerns and demonstrate that the interaction between man and machine can be a smooth and problem-free process, making everyday work a great deal easier. The commissioning phase will conclude with a quality assessment of your automated system.





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 new 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 AGVS specialists will be on site to answer all your questions. After the commissioning phase, we begin the final phase of the project – that is, our diverse range of maintenance and support services.

Your benefits during commissioning:

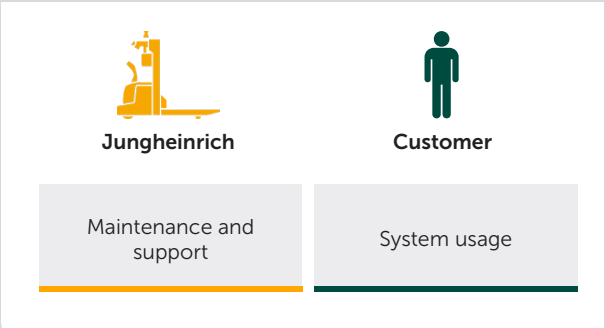
- On site start-up assistance
- Seamless transition to productive operation
- Tailored level of support

We offer security.

Our service

If you opt for our service, you will always be on the safe side. With more than 400 forklift dealer locations across North America, we have one of the most extensive service networks in the industry. Whether it's preventive maintenance against failures, repairs or full-service agreements for a complete, carefree package – with us, you are always in good hands.

Jungheinrich technicians in your area will assist you in the event of any challenges. Our service engineers have not only completed specialized training in the field of system trucks, but they are also highly familiar with your Automated Guided Vehicle 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 available

When included as a part of your AGVS project or solution, our support staff is a phone call away in the occurrence of faults or general questions regarding 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 warehouse requirements, you can choose between different support levels. We can accommodate all needs and provide round-the-clock support 365 days a year. After the commissioning phase, we come to the final stage of the project – that is, our diverse range of comprehensive maintenance and support package selections suited to your needs.

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 Vehicle Systems.



EZS 350a NA – Tow Tractor

Towing capacity:
up to 11,000 lb (5,000 kg)

Features: Robust towing truck, suitable for towing multiple trailers and has compact dimensions for use in narrow aisles.



EKS 215a – High-Level Stacker

Lift height:

up to 236 inches (6,000 mm)

Capacity:

3,300 lb (1,500 kg)

Features: Versatile AGV, suitable for nondrive-under loading aids and stations

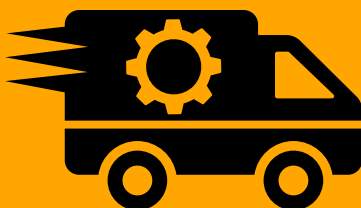
Our Automated Guided Vehicle Systems in action:
<http://www.mcfa.com/jungheinrich>

We deliver systematic service, round the clock.

Jungheinrich doesn't just stand 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.

More than 300 projects receiving service support



Parts Fast
or Parts Free
Guarantee

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
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

