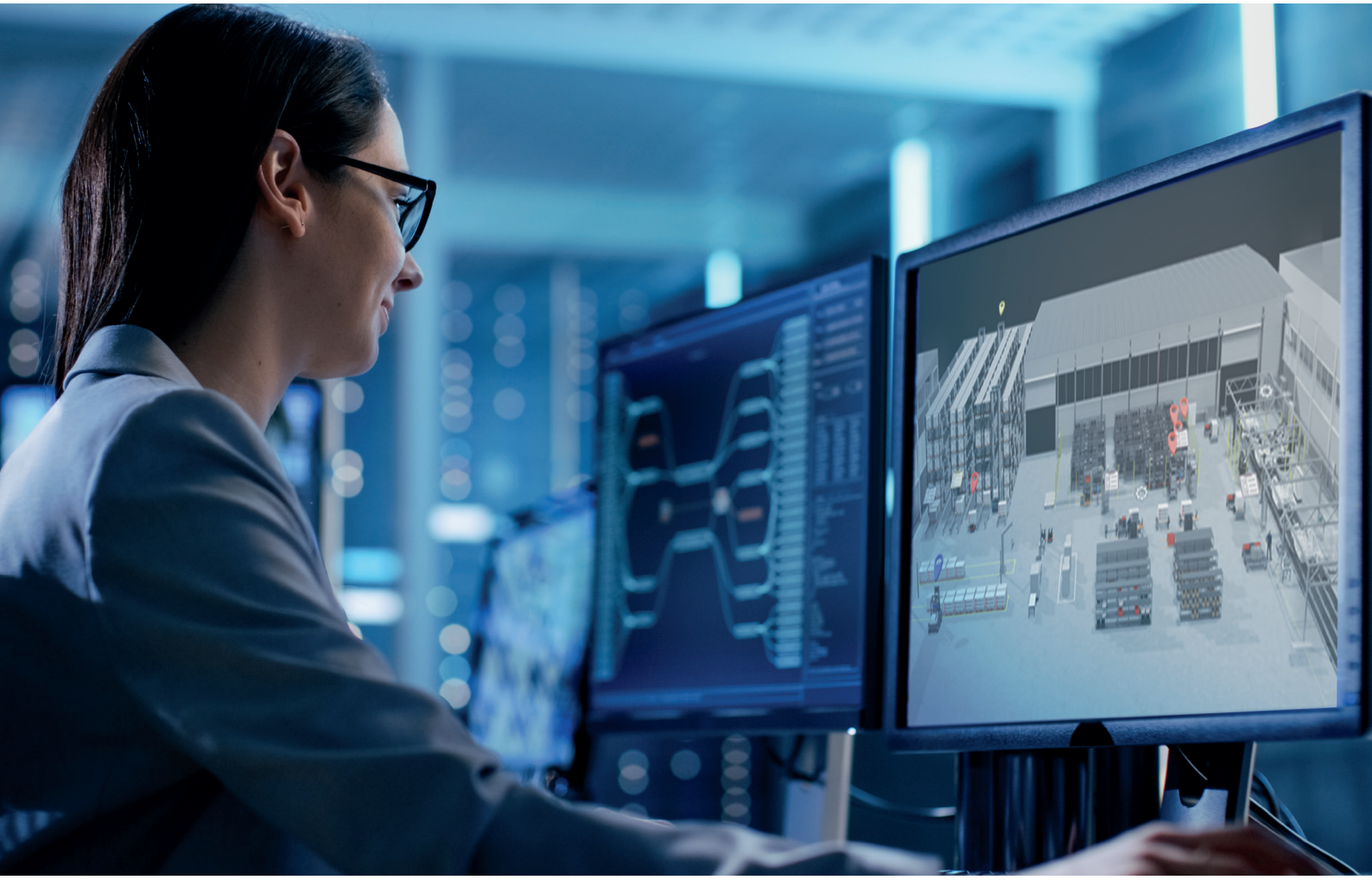
GRENZEBACH

WHITEPAPER INTRALOGISTICS



What does a universal control system do?

Central control of automated guided vehicles: intelligent, automated, manufacturer-independent

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Intelligent, automated intralogistics

The (intra)logistics market is growing rapidly, and the COVID-19 pandemic has given this development an additional boost. Almost all major players in industry and e-commerce are experiencing increases in sales and orders. Linked to this is the desire to automate, accelerate, and make the company's own logistics processes more flexible, adapting them to increased demands on dynamics and variability.

This requires automated guided vehicles with suitable, high-performance software that intelligently links incoming goods, production, storage and shipping. Independent, automated guided vehicles replace traditional conveying technology and move goods quickly and reliably to the desired locations. As a result, they sometimes take on dangerous, difficult or ergonomically strenuous activities, which allows employees to devote themselves to other demanding tasks.

In short: Intelligent, automated logistics is the foundation for optimum productivity in your company.

"Digitalization is not a substitute for people – instead it expands their possibilities."

Peter Bartels, Peter May and Dominik von Au in f.cube

What does the term “universal control system” mean?

The universal control system is software that controls automated guided vehicles (AGVs) independently of manufacturer and type. It collects, coordinates and optimizes order picking and transport orders, which are usually transmitted by the Enterprise Resource Planning (ERP) or Warehouse Management System (WMS). After intelligent order optimization using a Warehouse Control System (WCS) and appropriate vehicle selection, it sends the information to the automated guided vehicles (AGVs) in the form of driving orders. The universal control system is therefore a modern fleet management system that includes the central control and monitoring of vehicles and also communicates with other systems, such as the Security Manager or peripheral devices.

GUIDELINES FOR INTERFACE COMMUNICATION: VDA 5050

In order to standardize interface communication between the control system and the individual vehicles, the German Association of the Automotive Industry (VDA) and the German Engineering Federation (VDMA) launched the VDA 5050 project. It sets out guidelines for controlling different vehicles and vehicle types from different manufacturers under one control system. Based on MQTT – an open network protocol for machine-to-machine communication – driving commands are transmitted from the control system to the vehicle. At the same time, the vehicle sends conditions and messages to the control module.
Specialists in AGV and control systems – including manufacturers such as Grenzebach – are responsible for developing the VDA 5050. The VDA 5050 is constantly being further developed and optimised.

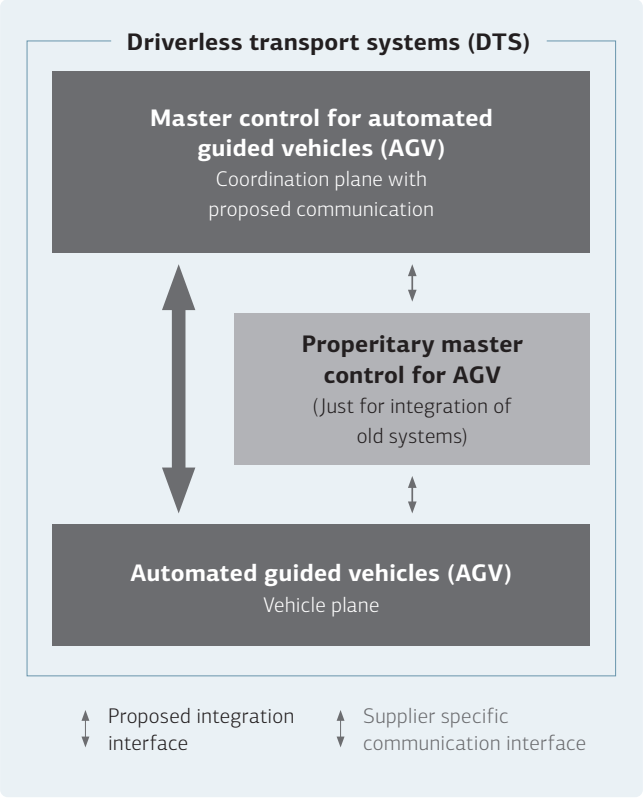
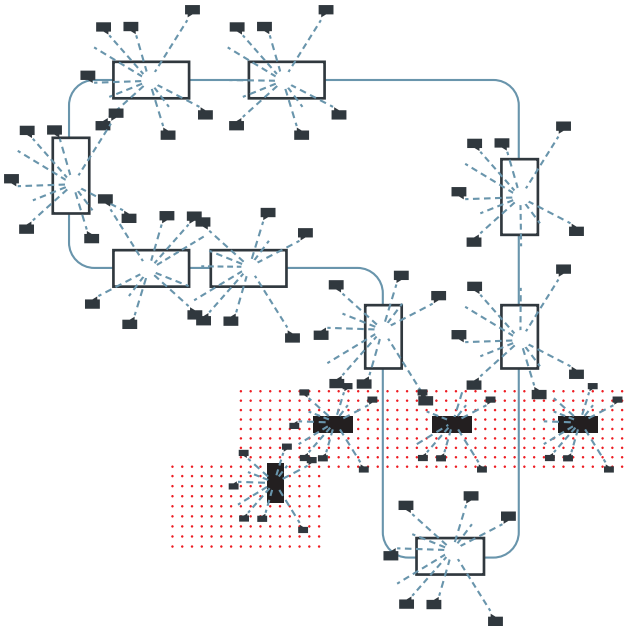


Figure 1: Integration of DTS inventory systems

LIMITS OF THE VDA 5050

The VDA 5050 supports automated transport by automated guided vehicles from different manufacturers under a comprehensive control system. But even this interface description has its limitations. The following points are not regulated in the current version:

- Responsibilities in projects with different manufacturers of vehicles and control systems
- Communication to superordinate logistics systems such as customer-specific ERP systems or higher-level Warehouse Management Systems (WMS) and the control system
- Communication with peripheral devices (robots, hall gates, elevators, charging stations, etc.)
- Exchange of maps between AVGs and control system and sharing of location information

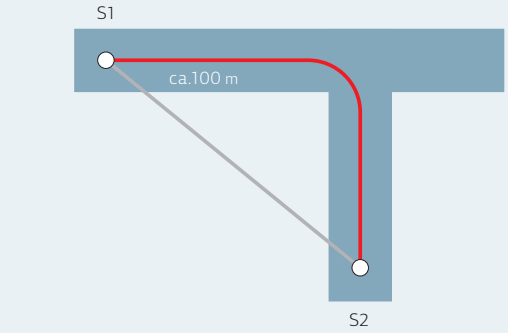


VDA 5050 leaves room for interpretation

The VDA 5050 gives every manufacturer and control module supplier a great deal of freedom in interpretation. It would be similar to language: The same language is spoken, but in different dialects and with varying comprehensibility.

To illustrate the difference, the following example describes the different ways of interpreting the travel path with nodes and edges. The truck is supposed to travel from starting node S1 to destination node S2. This trip can be implemented using three different approaches:

APPROACH 1



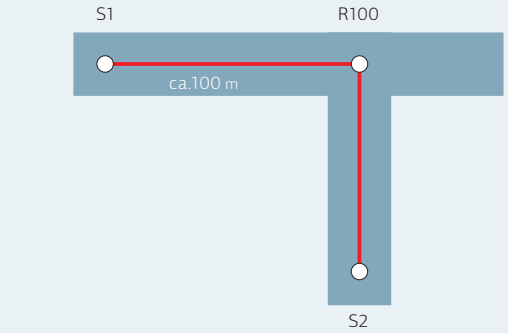
VEHICLES:

- Know the paths (blue grey)
- Calculate the route (red line) itself and report the route to the control system
- Know all parameters and are able to recognize situations (main street, side street, railway station, etc.) independently and react accordingly (speed, protection zones, avoidance, etc.)

CONTROL SYSTEM:

- Sends run commands and coordinates of start and destination points (S1 & S2) to the vehicle
- Receives current position data from the vehicle

APPROACH 2



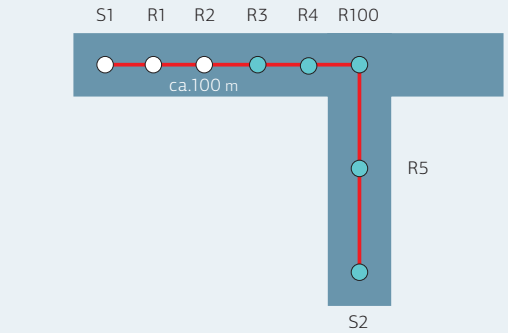
VEHICLES:

- Receive routes that are precisely defined with the help of nodes
- Must know the driving characteristics independently (speed, protection zones, etc.)

CONTROL SYSTEM:

- Knows only the most important parameters (e.g. max. speed)
- Sends run commands and the start and end points (S1 & S2) to the vehicle
- Receives current position data from the vehicle

APPROACH 3



VEHICLES:

- Drive exactly along the transmitted route with the help of street nodes

CONTROL SYSTEM:

- Only the control system knows the path network and the routes (nodes and edges) and sends them to the vehicle consecutively in packets (first only the white ones, then only the turquoise ones)
- Only the control system knows the details such as speeds and other parameters
- Receives current position data from the vehicle

Due to the scope for interpretation and the complexity of the different systems, it is important that close coordination takes place between the individual project partners (control system manufacturers and vehicle manufacturers).

The advantages of a universal control system in detail

A universal control system brings with it a number of aspects that positively impact your business's efficiency and productivity. These include:

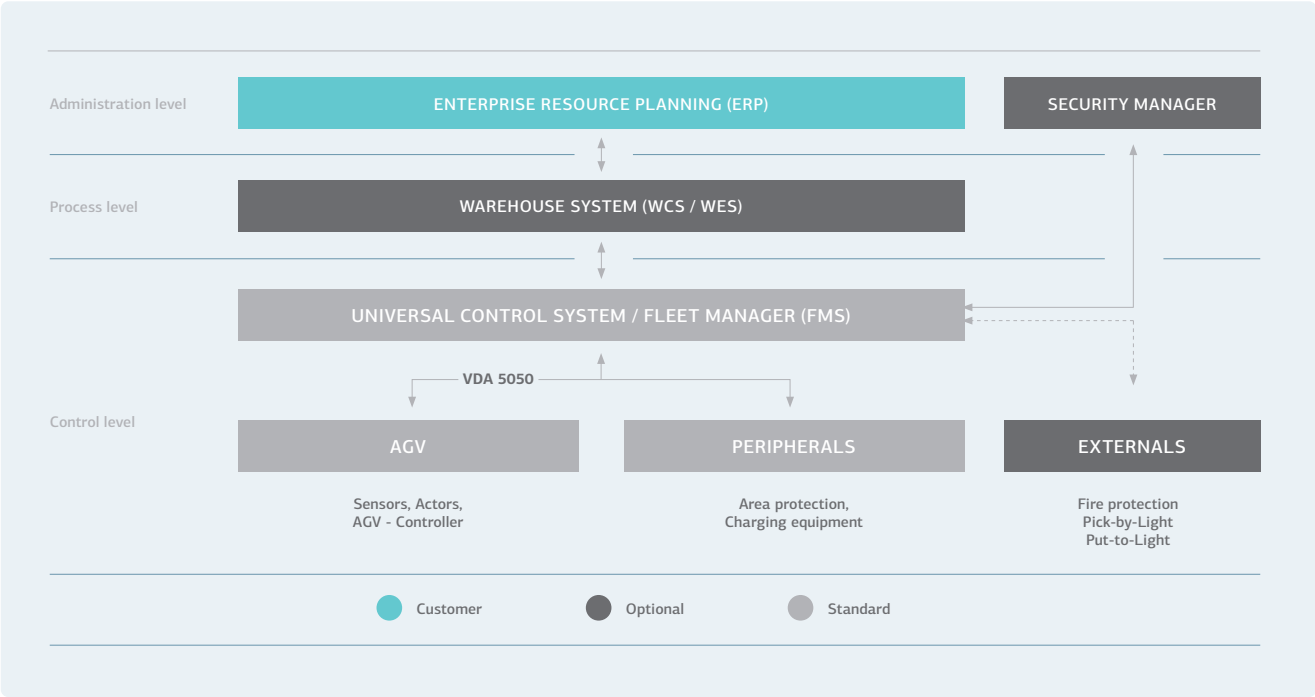
- Overview of the entire logistics process and efficient management of "routes" as an important resource in production and logistics
- Reduce complexity by using an overarching coordination level for all transport vehicles and vehicle types
- One-off investment expenditure or only one license model for the control system in the entire hall or within a plant
- Scalable thanks to the easy connection of additional vehicles in the event of changes in demand
- One point of contact for all issues (updates and upgrades, data security, adjustments, questions and errors)
- One-off connection of the control system to existing systems (WMS, ERP, alarm systems, interfaces to peripheral devices, etc.)
- Reduced implementation time with a single control system for all vehicles, regardless of independent manufacturer
- Control of different vehicle types (tow trucks, underbody vehicles, forklifts, etc.) in a common software, enabling end-to-end process automation with cooperating vehicles
- Increased flexibility thanks to increased vehicle autonomy
- Reduced training effort for operators, administrators and maintenance personnel

As an experienced automation specialist, Grenzebach has developed a product that encompasses all of this in the form of the universal control system. What's special about this: Automated guided vehicles from other manufacturers can be easily integrated into Grenzebach's Fleet Manager – even into large, complex fleets, completely independent of vehicle type and brand.

Logistics that thinks ahead – the Grenzebach Group's universal control system under review

Imagine having an intelligent control center for your entire intralogistics for your production or warehouse that is perfectly adapted to your logistics process. From transport orders and vehicle selection to vehicle energy management – everything is clear, everything integrated, largely automated and, above all, independent of the vehicle manufacturers.

Intelligently organizing complex processes is one of Grenzebach's strengths. Grenzebach's universal control system goes one step further than the VDA 5050 and simplifies the overall organization by ensuring that the entire AGV speaks the same language with all vehicles.



FLEET MANAGER AS THE CENTERPIECE

Grenzebach has developed the Fleet Manager as the central software for controlling all AVGs. It coordinates all vehicle movements based on transport orders from an inventory management system, the Warehouse Control System (WCS), which is aware of all logistics processes and manages the entire warehouse. For order management in the goods-to-person solution, the Warehouse Execution System (WES) is integrated and, which controls, monitors and optimizes the material flow. Algorithms ensure intelligent vehicle selection and route finding. The Fleet Manager also controls the energy management of the vehicles. External components and peripheral devices are integrated via various interfaces. The connected Security Manager regulates the authentication and the definition of roles and rights.

The Fleet Manager can be easily integrated into existing software ecosystems and consistently interlinks all levels and mo-dules in a single control system – regardless of the manufacturer. Interfaces to ERP, WMS and other logistics control systems, as well as to various machines and plants, are part of Grenzebach's standard portfolio of universal control systems.

THE FLEET MANAGER PERFORMS THE FOLLOWING TASKS:

AGV task management
Intelligent selection of vehicles and control of all vehicle movements.

Management of rights
Integration of a role-rights-concept carried out by the Grenzebach Security Manager (OAuth2 process).

Energy management
Monitoring of battery conditions and smart charging management.

Alarm management
Sending information about faults in the system to the employee, e.g. via e-mail.

Interface to the ERP system
Transmission and feedback of order information.

Interface to external periphery
Communication with external hardware, such as robots, hall doors, elevators, etc.

Interface to fire protection
Controlled shutdown of the equipment following a predefined scenario in the event of fire.

Vehicle interface
Interface to the Automated Guided Vehicles as per VDA 5050 (manufacturer-independent).

OTHER ADVANTAGES OF THE TRIED-AND-TESTED SOFTWARE INCLUDE:

- Optimized, deadlock-free route finding
- Optimal planning and validation of travel routes (e.g. on the basis of CAD data)
- Fully usable as a simulation

The web-based user interface offers a comprehensive system overview of travel routes, vehicles, logistics processes and notifications. Control, parameterization and diagnostic options can be selected intuitively. The user-friendliness is further supported by an individually customizable interface. You can influence language, color and design and assign different roles and rights to different people.

"Every manufacturer of automated guided vehicles has its own software. This makes it difficult to operate different vehicle types from different manufacturers in one system. Vehicles often use exclusive areas and routes, which greatly increases space requirements. The integration of different software is time-consuming and costly. A universal control system based on the VDA 5050, like the one Grenzebach offers, solves precisely these problems."

Philipp Marb,
Head of R&D and Product Management at Grenzebach

Automation specialist Grenzebach – For future-proof intralogistics

Grenzebach literally drives your business forward by automating your systems and processes. For more than ten years, the automation specialist has been supplying control systems for automated guided vehicles, ensuring an efficient flow of materials and communication in factory and logistics halls. This allows your company to grow and remain competitive in a changing technological and social environment.

The approach: holistic solutions that are tailored to your needs. To this end, Grenzebach will carry out a detailed analysis of your current situation and develop a specific, precisely tailored solution package – including hardware, software and service.

Trust in 60 years of experience in the automation of industrial processes. Grenzebach's expertise, collected in projects with numerous well-known customers from all over the world, is used to find suitable solutions for every customer. Another advantage: Grenzebach manufactures its own vehicles and is therefore synonymous with the highest industrial quality.

YOU ARE ON THE SAFE SIDE WITH GRENZEBACH:

- An independent family-owned company with direct access to your contact partner
- Access to the expertise of around 650 engineers and software developers
- High innovativeness, with fast prototyping and updates
- References from well-known customers from all over the world
- Thanks to production and service locations in three time zones, Grenzebach is available worldwide to offer customers a global service

The aim is to relieve and support your team with automation solutions. In the future, a shortage of personnel will further drive demand for automation.

> "Automation is the first step towards resilient and flexible intralogistics. Consistent use of data from processes is essential in order to be able to continuously optimize processes and react flexibly to unexpected requirements."
>
> Natalie Schadl,
> Product Manager Software Solutions
> at Grenzebach

Have we piqued your interest? Feel free to contact us with your questions. We will support you in analyzing your processes and optimizing them wherever necessary.

We look forward to hearing from you.

Your Grenzebach Intralogistics Team

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