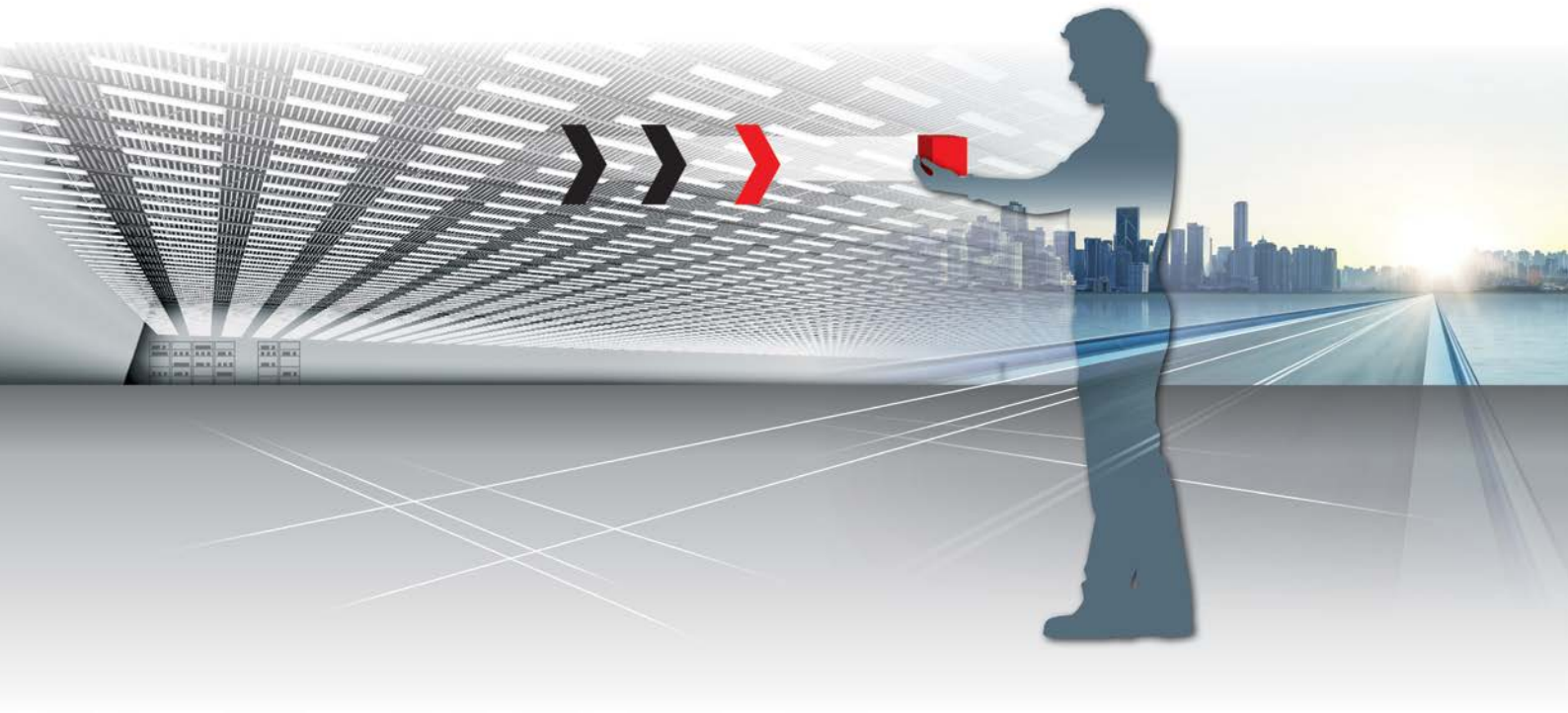
GRENZEBACH

WHITE PAPER | INTRALOGISTICS



Which Goods-to-Person solution is right for me?

A comparison of automated warehousing and order-picking systems

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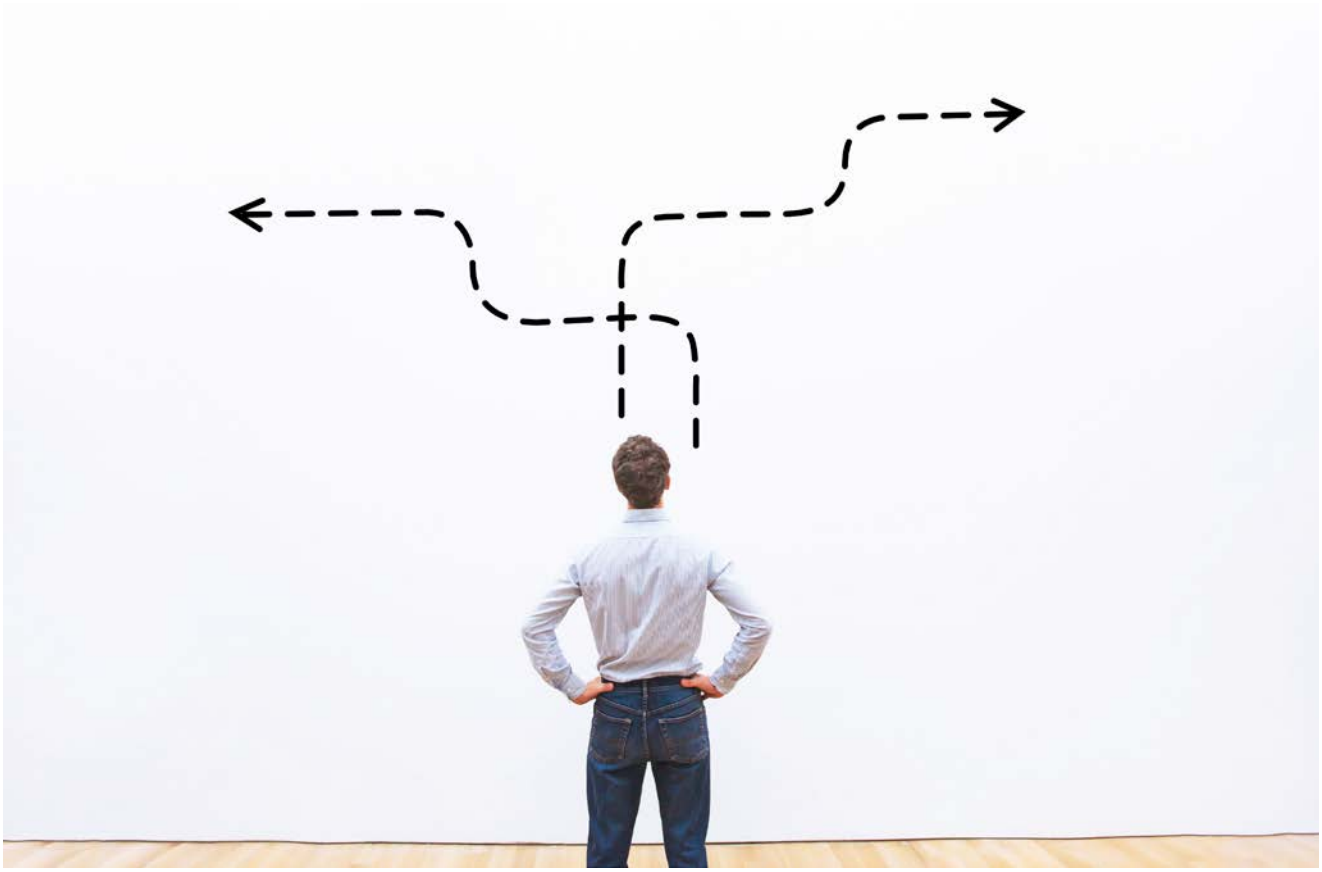
Goods-to-Person order picking: automation solutions at a glance

E-commerce is booming and changing every day. In many industries, small and individual parts need to be selectively provisioned during production. Employees in retail, manufacturing, and logistics are facing challenges greater than ever before. And yet much of the order-picking process in warehouses today is still performed manually. Many decision-makers in the logistics sector are currently considering automation to reduce the workload of their employees and to assist them, as well as to make fulfillment processes more efficient and robust for the future.



In this white paper, you will learn more about the current underlying conditions that apply to automated goods-to-person solutions.

We will present four order-picking systems in detail:

- AutoStore
- Automated small-parts warehouse
- Shuttle system
- Automated guided vehicles

Data and facts from the industry, as well as assessments by experts, will also be provided in order to create a more complete picture.

After reading this white paper, you will be familiar with the advantages and disadvantages of four different goods-to-person solutions and have a solid foundation for making a decision with respect to your next move towards automation.

We hope you enjoy reading this white paper and wish you all the best in your future endeavors!

The Grenzebach Intralogistics Team

The changing face and drivers of modern logistics

Nothing is as constant as change. As someone responsible for warehouse logistics, you can most likely relate to this. What is particularly accelerating the changes in intralogistics for the retail sector today? What does an automated goods-to-person solution need to be able to handle an order for your team at the warehouse and the system to work together as effectively as possible? We shine a spotlight on the drivers of change in warehousing and fulfillment.

THE E-COMMERCE BOOM

Large numbers of small-quantity orders – this trend is continuing unabated. Studies predict, for example, that up to 95 percent of all retail purchases will be made online by 2040.[1] The Covid-19 pandemic has massively accelerated the trend of e-commerce as a replacement for brick-and-mortar retail. For example, according to the German E-Commerce and Mail Order Association (BEVH), gross e-commerce revenues in Germany grew by just shy of 15 percent in 2020.[2] Nearly one in three online shoppers in 2020 was over the age of 60.[3] This shows that the Covid-19 pandemic has led to e-commerce finally catching on in this age group as well. Industry experts believe that most of these new online shoppers will also continue to shop online after the pandemic ends.

4 of 10 consumers
now shop online more than once a week.[4]

HIGH RETURN RATES

Shoes and clothing purchased online are returned particularly frequently. According to the University of Bamberg's returns management research group, 46 percent of packages end up going back to merchants.[5] According to EHI Retail Institute e.V., the returns rate is estimated to actually be closer to 50 percent across all sectors, and for half of all online retailers, it stands at least at ten percent.[6] This means that it is critical for retailers to get returns back into the system as fast as possible in order to be able to resell them. Quickly processing returns is becoming one of the most important parameters when it comes to fulfillment performance.

92 %
of returns are resold.[7]

[1] Figures for UK – source: https://www.nasdaq.com/articles/uk-online-shopping-and-e-commerce-statistics-2017-2017-03-14
[2] Source: https://www.dw.com/de/corona-sorgt-f%C3%BCr-beispiellosen-boom-beim-onlinehandel/a-56348180
[3] Source: https://www.dw.com/de/corona-sorgt-f%C3%BCr-beispiellosen-boom-beim-onlinehandel/a-56348180
[4] Source: Study commissioned by BEVH; https://www.dw.com/de/corona-sorgt-f%C3%BCr-beispiellosen-boom-beim-onlinehandel/a-56348180
[5] Source: https://www.uni-bamberg.de/news/artikel/retourenmanagement-2019
[6] Source: https://etailment.de/news/stories/Retouren-Intralogistik-Taschensorter-20978
[7] Source: Research Group for Returns Management at the University of Bamberg; http://www.retourenforschung.de/info-retourentacho2019-ausgewertet.html

OMNICHANNEL FOR B2B AND B2C

Order-picking systems today increasingly have to serve the channels for private and business customers simultaneously, such as making pallets with large quantities of goods for brick-and-mortar retail outlets available (such as a company's own stores), while at the same time handling extremely small quantities of items for individual consumers. Phenomena such as the platform economy – which encompasses business models that bring together suppliers and prospective customers in digital marketplaces – add further complexity to this process.

VALUE-ADDED SERVICES

The role of logistics in the value chain is becoming increasingly important and multifaceted. To meet individual customer requirements on an order-by-order basis, logistics now also handles production tasks. One example is what is known as kitting – the assembly of parts at the warehouse, such as for the automotive sector or for construction machinery. In the case of products for consumers, personalization is directly incorporated into logistics processes, for example, or individual sets of different items are packed together.

VOLATILE MARKET CONDITIONS

Being able to respond to changes in customer demand quickly and with flexibility – that is what high-performance logistics is all about. Special days associated with widespread sales and promotions such as Black Friday or Cyber Monday not only generate a surge in demand, but also often create new trending items. In the run-up to Christmas, on the other hand, low-value, high-volume products are also in particularly high demand.

840,000 new customers
created an account with online retailer Zalando on Black Friday in 2019.[8]

To remain competitive in the face of these developments, intralogistics needs resilient systems and processes that can handle order peaks and respond both effectively and with flexibility to unforeseen events.

56% of logistics specialists
have difficulties with consumers' changing shopping habits.[9]

- **Partially or even completely automating warehouse logistics, especially goods-to-person solutions, can play a decisive role in this regard. When choosing the right automation solution, it is important to keep the above aspects in mind.**

[8] Source: Zalando SE; https://corporate.zalando.com/en/newsroom/en/news-stories/zalando-achieves-record-breaking-cyber-week-results
[9] Source: BVL; https://www.bvl-trends.de/trend/veraendertes-kaeuferverhalten

Automation: comparison of four different systems

How do the most popular systems work specifically? What are their advantages and disadvantages? We provide answers to these questions in the following by presenting an overview of four different goods-to-person solutions.

AutoStore

AutoStore has been on the market as a goods-to-person solution for about 25 years. The system can also be implemented in existing buildings and can generally be installed comparatively quickly. Considering the maximum possible stacking height of 5.40 meters, this system makes it possible to achieve an extremely high storage density per square meter of floor space.

AutoStore can achieve medium to high throughput capacity with low to medium throughput rates of the storage bays. The dimensions of the items are limited to the standard size of the containers (600 by 400 millimeters), and the weight of a container cannot exceed 35 kilograms.

The system is equipped with ergonomic and efficient workstations. Both performance and storage capacities are easily scalable. A higher level of additional capacity must be planned into the system's design to accommodate seasonal fluctuations. During ongoing operations, it is only possible to directly access around ten percent of the containers; the rest have to be "dug out," i.e. transported upwards in a time-consuming process. As such, the assortment of goods should be clearly prioritized according to the ABC method. In the event of volatile and/or increasing demand, the time needed for "digging" and the additional vehicle activities must be taken into account.

⊕ **Advantages:**

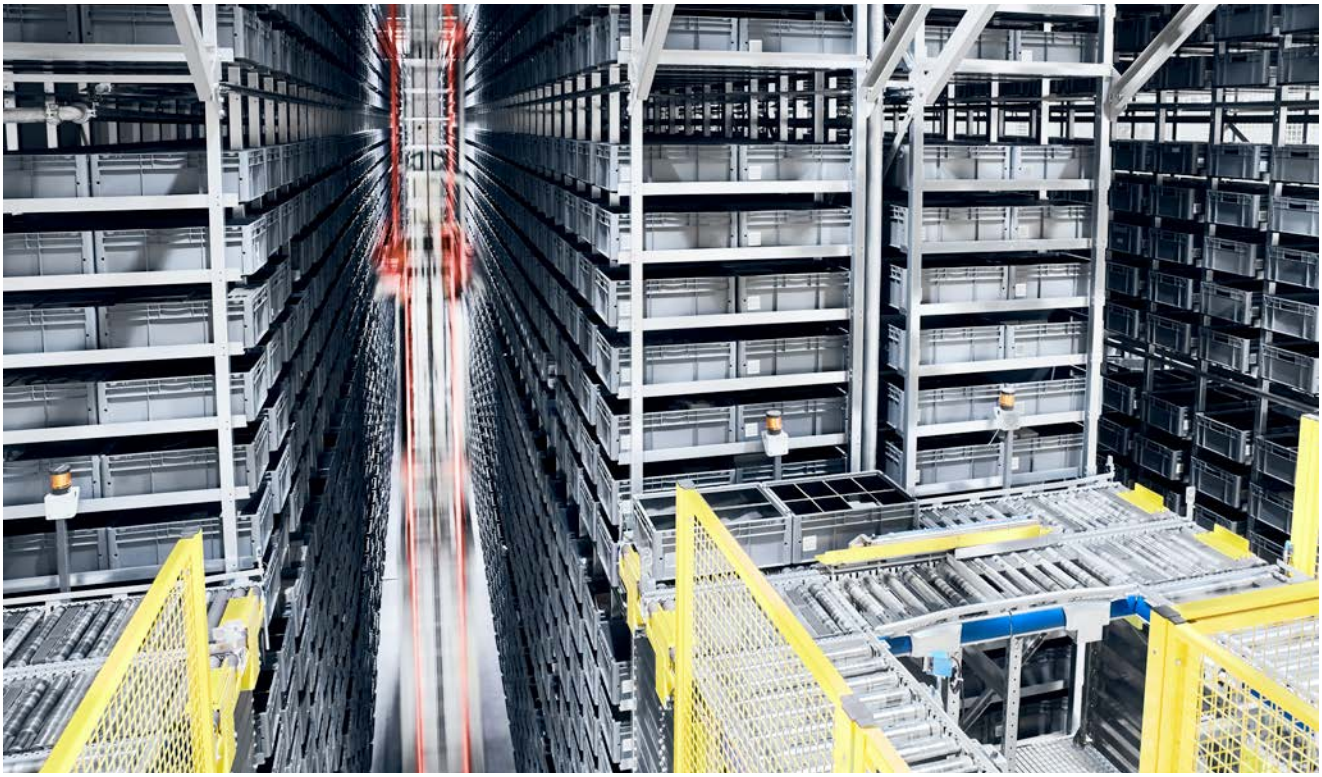
- Extremely high storage density per unit of floor space with a maximum stacking height of 5.40 meters
- Fast installation, even in existing buildings
- Easily scalable in terms of performance and storage capacity

⊖ **Disadvantages:**

- Only about ten percent of items directly available
- Article sizes limited to container sizes and payload
- Nonproductive time for digging and additional vehicle activities as demand increases

► **AutoStore is a compact system that is easily scalable – but has limits when it comes to item and bin sizes and payload**

Automated small-parts warehouse



They are one of the absolute classics of intralogistics – automated small-parts warehouses in which goods are stored and retrieved using AS/RS systems. The racks can be up to 22 meters high – given this ceiling height and double-deep racking, it is possible to achieve a high storage density. Automated small-parts warehouses can only be implemented in specially constructed new buildings. The construction of such buildings normally requires a lead time of about 12 to 18 months.

This goods-to-person solution is well suited for consistent and relatively low throughput capacities. It can also handle heavy stored goods beyond 50 kilograms and can be used to store special sizes as well.

Automated small-parts warehouses, which require conveyor technology and AS/RS equipment for operation, function reliably and require little maintenance. They are designed for constant performance. Due to their comparatively inflexible design and architecture, scalability is either extremely limited or requires a great deal of effort, such as the construction of additional lanes.
In order to be able to accommodate seasonal order peaks, a high level of additional capacity must be planned into the design of an automated small-parts warehouse. Otherwise, volatile and/or constantly increasing demand for order items and SKUs (stock-keeping units) can lead to bottlenecks.

⊕ **Advantages:**

- Good storage density due to high design and double-deep racking
- Can be used to store items with special dimensions, as well as heavy goods
- Durable, low maintenance, and reliable

⊖ **Disadvantages:**

- Long lead time due to the need to construct a new building
- Low scalability in terms of storage capacity and performance
- Bottlenecks in the event of volatile and/or constantly increasing demand

► **The automated small-parts warehouse is a durable classic for environments where little change is expected.**

Shuttle System

In the world of intralogistics, shuttle systems have already been around for decades, and thus constitute an extremely mature technology. The racks can be installed up to a height of 18 meters. Conveying technology and vertical lifters are required for operation. This infrastructure requires certain structural conditions, meaning that not every facility is suitable for this system, and the corresponding project lead time must be taken into account.

A shuttle system can be used to achieve high to very high throughput with a high turnover rate of the storage bays. The shuttle trays (bins) can hold goods with a maximum length of 650 mm. The maximum weight of the bins cannot exceed 50 kilograms. Climbing versions of shuttle systems provide operators with additional flexibility in goods-to-person solutions.

Additional capacity always needs to be planned in for seasonal fluctuations when designing a shuttle system. Volatile and/or increasing demand can be accommodated by using additional shuttles. Performance can also be permanently increased through the use of climbing shuttles and the expansion of warehousing capacity.

⊕ **Advantages:**

- High storage density even with heterogeneous hall layout
- Extremely high throughput possible
- Climbing shuttles add flexibility

⊖ **Disadvantages:**

- Long lead time due to the need to construct a new building
- Significant additional capacity required for seasonal fluctuations
- Items limited to bin size and weight

► **The shuttle system is a proven technology with excellent performance that can handle seasonal fluctuations to a limited extent.**

Warehousing and order-picking system using Automated Guided Vehicles (AGVs)


© BLG Logistics

"Amazon has long been setting the benchmark in e-commerce. The company specifically selected a goods-to-person solution based on an AGV system. The focus has always been on the technology's potential; staying ahead of the competition moving into the future was important to Amazon, not rapid amortization. The company's success proves Amazon made the right decision. Data collection has played a significant role in its success story. Amazon recognized that the interaction of software and flexible hardware makes it possible to optimize the system on an ongoing basis."

Matthias Bestle,
intralogistics expert at Grenzebach

An automated guided vehicle (AGV) system can be quickly integrated into new or existing buildings at any time. It can even be implemented with a ceiling height of just three meters. This allows the system to be installed in existing buildings both in urban locations and on brownfield sites within the scope of land recycling. In taller buildings, the infrastructure for this goods-to-person solution can be implemented multiple times on top of each other using storage platforms and freight elevators. In this context, the storage levels can be designed very flexible and also completely different.

When it comes to the use of goods carriers and storing the items, an AGV system is highly flexible. It scales well in terms of performance and inventory. Operators can thus respond quickly to higher demand – and are also well equipped for special sales days and peak times. AGV systems never lose their cool during peak periods, and high order volumes and an active, wide range of products make them perform better. Even returns are no problem for the system. In fact, the opposite is true – it becomes more powerful due to the increasing chaotic distribution of the items.

⊕ **Advantages:**

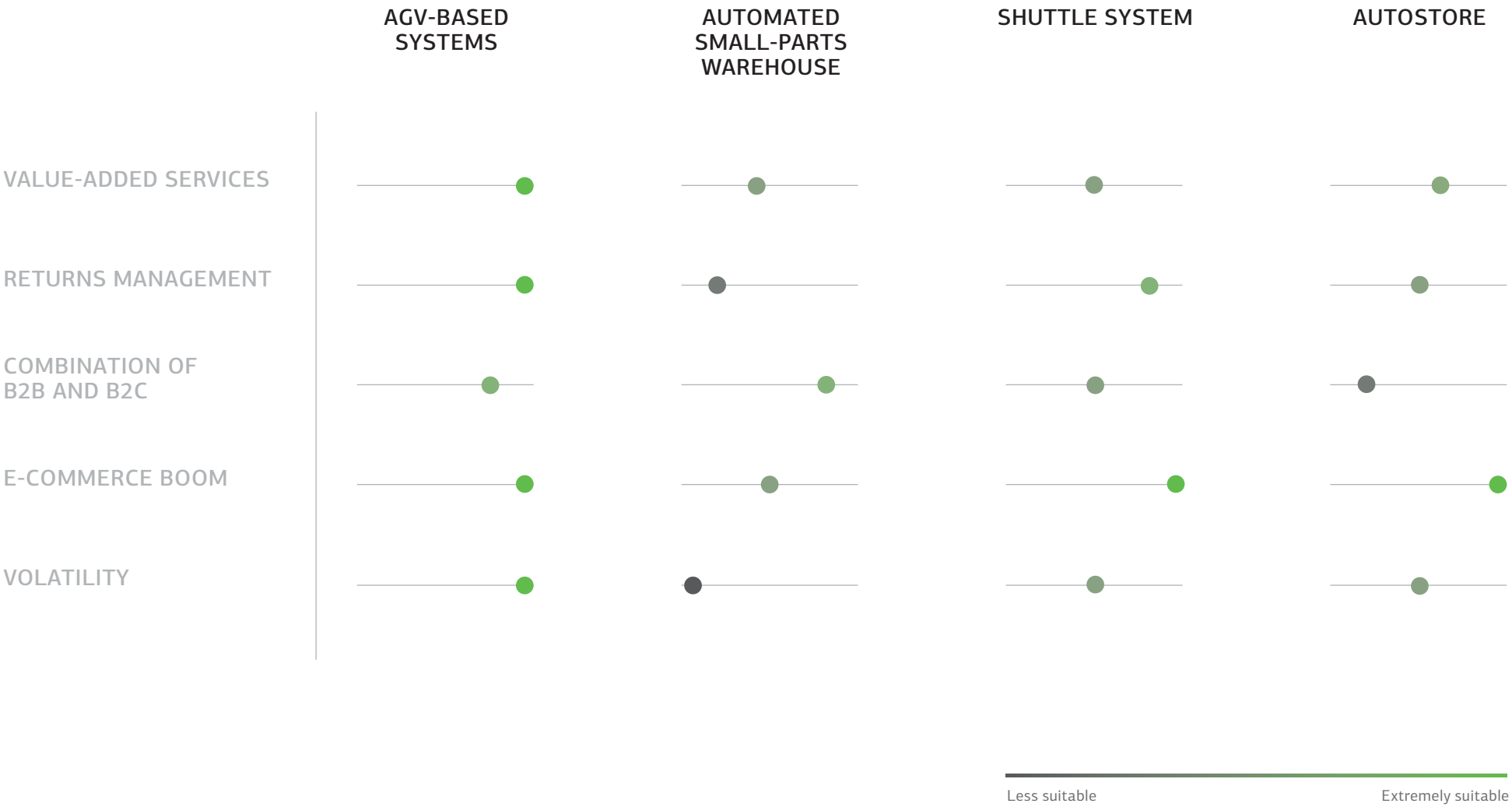
- Can be installed in buildings with ceilings as low as 3 meters high, ideal for existing buildings in urban locations
- Storage levels and goods carriers can be designed in a variety of ways, ideal for returns and very small quantities
- Existing systems can be adapted easily and with flexibility

⊖ **Disadvantages:**

- Requires slightly more floor space
- Storage platforms and freight elevators are required for multilevel facilities, if not already available

▶ **Infrastructure with automated guided vehicles can be installed quickly in both existing and newly constructed buildings. The working levels and the entire system can be designed with considerable flexibility, both when planning a new solution and in the case of existing installations. As such, the system can be expanded at any time.**

Overview of the compared systems in relation to the drivers of change in modern logistics



Logistics for the future

"A lack of staff in logistics is shaping up to be a permanent obstacle to growth. This makes it all the more imperative to implement powerful and forward-looking automation solutions today – ideally, those systems that can also speed up the onboarding of new employees, such as when it comes to working with goods-to-person solutions."

Professor Michael Krupp, Augsburg University of Applied Sciences

E-commerce continues to grow. Logistics processes are becoming more complex – because tasks from production have been added and because different channels need to be served simultaneously. Reducing returns as far as possible and dealing with those that do take place as intelligently as possible – as an individual in charge of logistics operations, the challenges you face continue to increase. At the same time, demographic change is making it increasingly difficult to find new employees.

In order to remain competitive and leverage the e-commerce boom for your own business development, there is simply no way around an automated goods-to-person solution.

In this white paper, we have introduced you to four systems:

- AutoStore
- Automated small-parts warehouse
- Shuttle system
- Automated guided vehicle system for order picking

CREATING TRANSPARENCY AND PROGRESS WITH DATA

Automation is the first step towards resilient and flexible warehouse logistics. With an automated solution, you'll be ready to act when unplanned situations arise. Covid-19 has shown us how quickly fundamental changes can occur. Data from an automated solution makes processes transparent and is critical to flexibility. In order to continuously improve, the combination of software and hardware flexibility is crucial.

All of this benefits your logistics team and your bottom line.

Nothing is as constant as change.

You read this sentence at the very beginning of this white paper. And we have deliberately put this sentence at the end – coupled with the promise that we will focus on the future of intralogistics each and every day in order to support you in the best way possible. For example, we are monitoring developments such as artificial intelligence or blockchain technology. Let's keep an eye on things together!

The Grenzebach Intralogistics team

> "Logistics 4.0 in terms of data-driven logistics is not an end in itself. Data makes processes transparent. And that is the basis for more efficient workflows, for more accurate forecasting methods, for new services, and for reliable early-warning systems."
>
> Professor Michael Krupp,
> Augsburg University of Applied Sciences

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