

Open Shuttle

Flexibility of transport processes through autonomous mobile robots (AMR)

A modern distribution centre faces a great deal of challenges: **increasing numbers of articles, greater demands for speed and quality in order processing**, as well as maximum flexibility. Moreover, storage systems need to be implemented in the most space-effective way possible and designed so that they can be adapted easily to changing conditions. The increasingly complex transport tasks within a warehouse must be as flexible and simple as possible, helping to **increase efficiency** and **reduce costs** at the same time.

With its Open Shuttles, KNAPP provides the ideal concept to respond to the rising demands in warehouses. The autonomous mobile robots have a wide range of application areas within a logistics system, combining **flexibility, scalability, intelligence** and **economic profitability**.

Flexibility

Intelligence

Configurable

Structure and function

The free-moving Open Shuttles cover complex transport networks within the warehouse and **can process all transport tasks** swiftly and flexibly. They are ideal for supplying work stations using the goods-to-person principle and support personnel during picking in all warehouse areas. The vehicles move completely **autonomously, without any form of optical or physical aids**. With the help of navigation technology based on **natural contour detection**, they respond dynamically to obstacles and plan their routes or alternative routes independently. They can therefore be used in busy warehouse areas and offer a flexible and space-effective alternative to static conveyor systems.

The KNAPP fleet management system manages and monitors the Open Shuttles centrally. Thanks to their individual and swarm intelligence, the Open Shuttles are always there where the work is. They can communicate with each other and distribute the tasks among themselves independently.

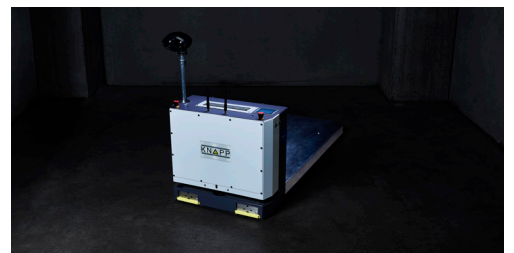
Areas of application

The Open Shuttle can be used in all warehouse areas and is a flexible alternative to static container or pallet conveyor systems. They can also be used to replace conventional forklift trucks and pallet jacks. They can convey a wide range of load carriers such as containers, cartons and trays and can also transport pallets safely through the warehouse. The Open Shuttle Fork can be used to pick up roller containers and small portable racks from the floor.

Depending on the processes carried out in the warehouse, the Open Shuttles are used for different tasks. For example:

- ▶ **Processing diverse transport tasks**
- ▶ **Supplying work stations with source and target containers**
- ▶ **Supporting the picking process**

Detailed information is provided in the section *Overview of application areas*.



Efficiency Safety Autonomy



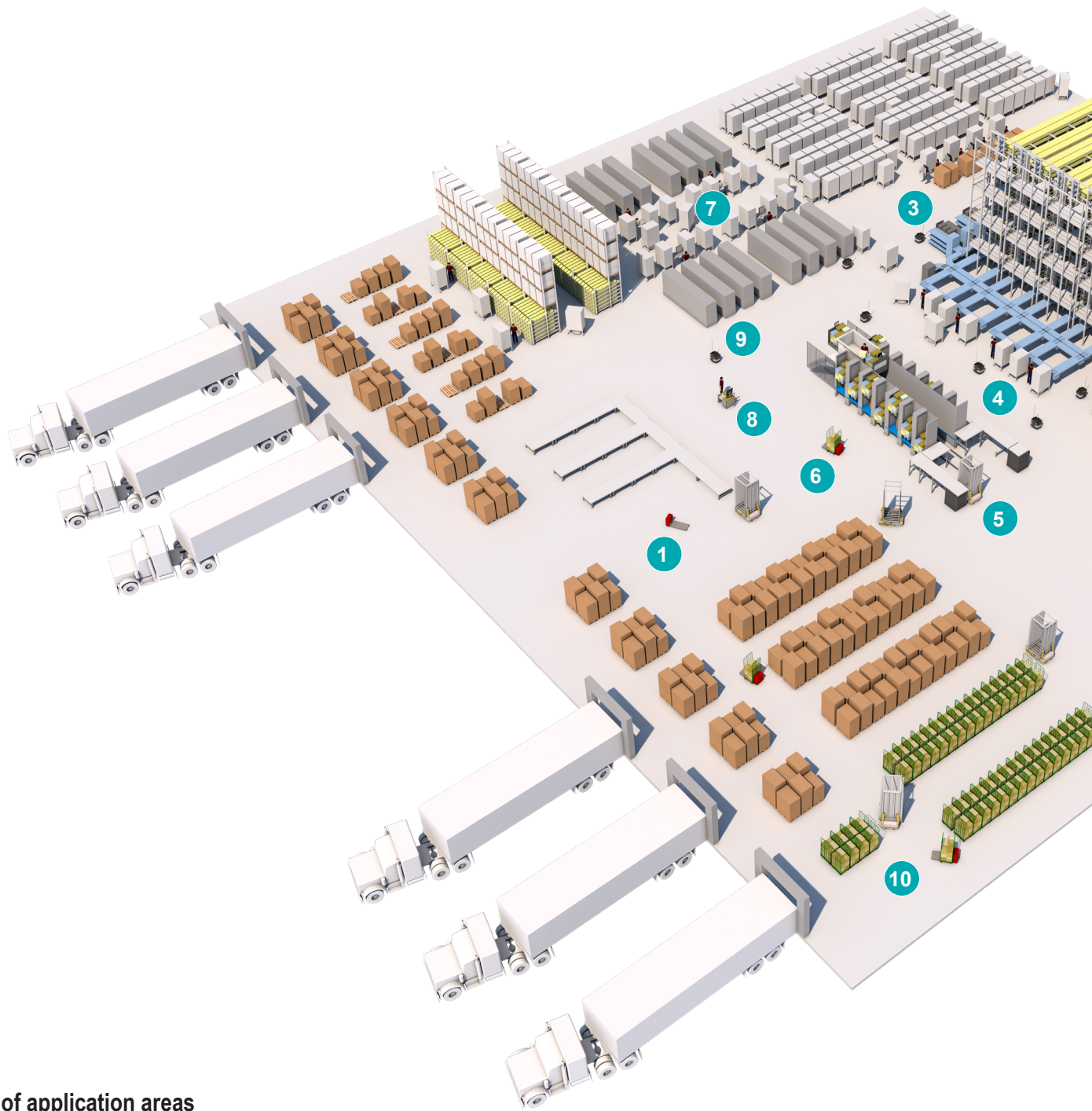
Innovative navigation technology

The innovative combination of integrated navigation technology and sophisticated sensor technology guarantees **100% safety for personnel**. The vehicles sense their surroundings while moving using their integrated laser scanners and can therefore respond quickly and flexibly to any obstacles. Simply by detecting contours, the Open Shuttles know immediately whether it is possible to avoid these obstacles or whether they need to search for an alternative route. This pioneering laser navigation system means that the transport vehicles do **not require any fixed routes, induction loops or previously defined paths**. During startup, the Open Shuttles are familiarized with the entire accessible surface of the warehouse by carrying out a reference run. They can use this surface freely when fulfilling their tasks. Only areas where the Open Shuttles may not drive are off limits. Moreover, traffic rules can be defined such as one-way routes, roundabouts or right-hand traffic.



Advantages at a glance

- ▶ Easy integration in an existing system without any structural modifications
- ▶ Fast amortization of the investment costs through low startup costs
- ▶ Low space requirements with minimal use of static conveyors
- ▶ Flexible connection of all warehouse areas
- ▶ Automatic navigation and independent avoidance manoeuvring
- ▶ Safe interaction between man and machine
- ▶ Free floor space
- ▶ Error-free processing of complex tasks
- ▶ Simple scalability in the event of fluctuation
- ▶ Rapid expansion and relocation possible
- ▶ Efficient and autonomous energy management
- ▶ Low maintenance and servicing costs
- ▶ Communication is possible with all Host systems



Overview of application areas

1

Collection in goods-in area

The Open Shuttles collect delivered articles immediately after the goods-in procedure and independently and quickly take them to different warehouse areas for further processing.

2

Storage into the high-bay racking system for pallets

The Open Shuttles transport the pallets from goods-in to the high-bay racking, where they transfer the pallets to the pre-zone for final storage.

3

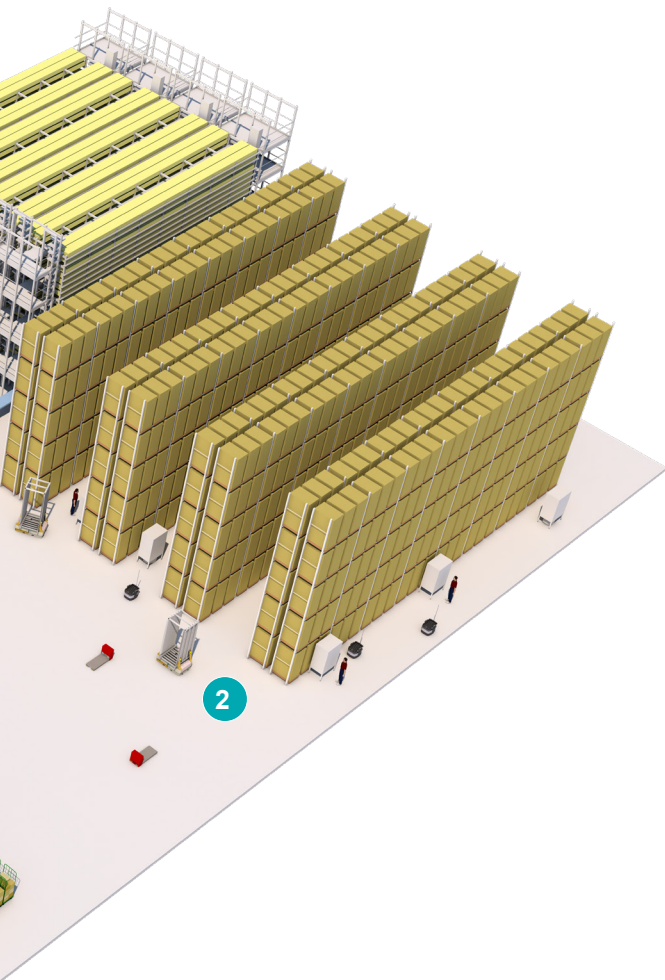
Storage into automated storage systems

Following decanting, the Open Shuttle conveys containers and other load carriers flexibly to the OSR Shuttle™. They are transferred at an infixed point to the conveyor system for final storage.

4

Goods-to-person supply to work stations

In order to reduce the distances personnel need to walk and thereby increase efficiency, the Open Shuttles bring the source containers to the Pick-it-Easy work stations according to the goods-to-person principle. As part of this process, the load carriers are collected at the OSR Shuttle™ and are transported to the work stations following the fastest route possible. If equipped with a small portable rack, the Open Shuttle Fork can also simultaneously transport several articles or orders to various work stations and remove all target containers from a picking station at the same time.



5 Supplying Pick-it-Easy work stations with source pallets

At Pick-it-Easy work stations, goods-to-person picking is carried out directly from the pallet. The Open Shuttles supply the work stations with source pallets; they transport the pallets to the work stations either directly from the goods-in area or from the high-bay racking system for pallets. The Open Shuttles also collect the pallets completely autonomously.

6 Transport supporting manual picking (pick-and-go picking)

Open Shuttles can be used in manual warehouse areas to transport order containers during the picking procedure. The autonomous mobile robot drives automatically to the corresponding warehouse areas with the target containers and positions itself next to the article to be removed. Personnel can therefore concentrate completely on their picking tasks – the Open Shuttle is always in the place where the picker needs it. This avoids strenuous tasks such as pulling and pushing heavy picking carts, fulfilling the ideal prerequisites for ergonomic work processes. Moreover, personnel do not waste valuable picking time by pushing a cart around.

7 Transport of small portable racks and special load carriers

The Open Shuttle Fork can pick up, transport and relocate complete racks and special load carriers from the floor.

8 Transport to check stations

The autonomous mobile robots convey order containers to the check stations flexibly and quickly. This facilitates fast quality checks.

9 Transporting urgent orders

Open Shuttles can transport urgent orders to Pick-it-Easy work stations or to the dispatch area quickly, without having to take the usual flow of goods into consideration.

10 Transporting completed orders to the goods-out area

As soon as the orders have been completed, the Open Shuttles can convey them to the dispatch area.

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Technical data

Container handling (Open Shuttle 50b, 100b)

Maximum speed	1.6 m/s
Maximum dimensions of load carrier	800 mm x 600 mm
Drop-off and pick up height	500 mm to 1,000 mm
Maximum working load	100 kg
Lifting device	Optionally integrated 550 mm to 1,500 mm
Battery life	6-8 h
Communication method	WLAN b/g/n standard

Pallet handling (Open Shuttle 1300)

Maximum speed	1,3 m/s
Maximum dimensions of load carrier	1,200 mm x 800 mm
Drop-off and pick up height	from 600 mm
Maximum working load	1,300 kg
Power supply	Supercapacitors
Communication method	WLAN b/g/n standard

Container handling with small portable rack or special load carrier (Open Shuttle Fork with lifting plate)

Maximum speed	1 m/s
Dimensions of small portable rack and special load carriers	Customer-specific design 1,200 mm x 800 mm
Drop-off and pick up height	0 mm to 130 mm
Maximum working load	1,000 kg
Battery life	5 h
Communication method	WLAN b/g/n standard