Are you looking for the optimum solution for increased efficiency?

We have the ideal solution: Warehouse navigation in narrow aisles.

Four advantages which should convince you to follow this path.

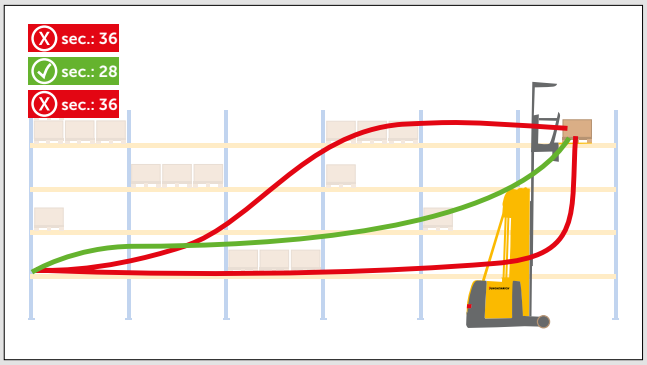
JUNGHEINRICH
Machines. Ideas. Solutions.

Advantage 1:
A touch of a button is all you need.

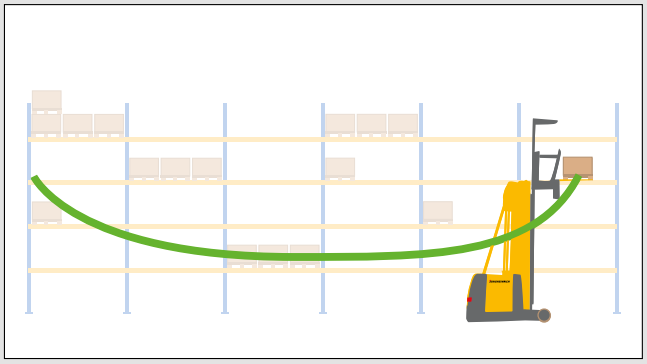
1. **The warehouse management system (WMS)** transmits the next rack location to be visited to the logistics interface on the truck terminal.

2. **The logistics interface on the truck terminal** "translates" the data and passes it directly to the truck controller. The truck now "knows" the next bay to be visited.

3. **Transponders in the floor** communicate its current position within the aisle to your truck.



The comparison – EKX with/without warehouse navigation:
Optimised approach with warehouse navigation allows time savings of up to 25 %. The "green curve" proves this: In the shortest time and over the shortest distance, with as little energy used as possible.



"Intelligent destination approach" of an EKX with warehouse navigation:
The truck computer calculates the quickest way to the target position. If the travel lever is activated, positioning is optimised. This includes all the processes necessary for this: Calculation of the route and of the lift path as well as time optimisation.

4. **A simple "push of the button"**
   The operator activates the travel command.

5. **The truck knows the fastest route**
   The fork lift travels (semi-automatically) and precisely to its destination. Via the shortest route.

6. **A simple "push of the button"**
   Once the command is received, the truck stacks or retrieves items independently and sends confirmation automatically to the logistics interface on the truck terminal.

7. **The logistics interface**
   "translates" and confirms for the WMS.

8. **And on to the next job**
   The WMS transmits the next rack location to be visited to the logistics interface on the truck terminal.

Advantage 2: The entire warehouse benefits.

Increased efficiency for the entire logistics system

- Up to 25 % increase in efficiency via warehouse navigation.
- Automatic and precise approach to the racking position specified by the warehouse management system (WMS) along the quickest route. With optimum acceleration and braking – the maximum truck speed can be fully utilised.
- No searching or back-tracking.
- No manual scanning for stacking and retrieving.

Very high level of process safety with low error rates

- Automated processes leave less room for error.
- Stacking and retrieval operations are always performed at the right locations.
- The WMS inventory is always up-to-date.

Easy integration

- The Jungheinrich Logistics Interface facilitates simple integration of the warehouse navigation into the existing IT system landscape.
- The Logistics Interface is installed as middleware on the radio data terminal. It creates a connection between the WMS and the truck.
- No functional changes to the WMS required.
- Changes to the warehouse topology are not required.

Improved ergonomics for the operators

- Significantly less strain on the operators who no longer have to search for items.
- Relaxed operation as "ancillary jobs" such as searching and scanning no longer apply.
- New employees immediately reach the level of experienced operators.

Greater robustness of the overall system

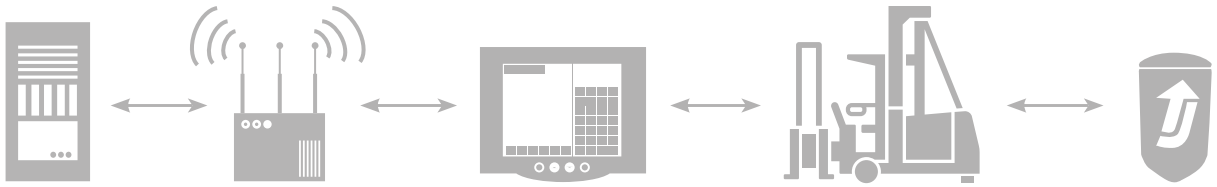
- Less rack damage since the forks are automatically positioned at the warehouse rack level.
- The racks do not require labels or such like, which could get damaged or scratched.
- As the RFID transponders are protected in the ground, the technology is not sensitive to faults or damage.

Energy saving

- Energy saving due to optimised movements.
- Reduction of the warehouse lighting is possible by illuminating the target position using the order picking spotlights.
- The active reach control saves time and energy when retrieving a pallet.

Advantage 3:
Easy connection of the narrow aisle trucks to the existing IT systems.

The server transmits the position of the next racking location to be visited to the truck terminal via the WLAN. The Jungheinrich Logistics Interface “translates” the data and passes it directly to the truck controller. As a result, the trucks now ‘knows’ which bay to visit next. The truck orients itself within the aisles by using the RFID transponders in the floor and is therefore aware of its current location at all times.



1 WMS server 2 Access point 3 Radio data terminal 4 Truck 5 RFID transponder

Advantage 4:
We can provide you with the ideal narrow aisle truck for every application.

EKS 210:
- Vertical order picker
- 1,000 kg capacity
- 7,845 mm picking height

EKS 312:
- Vertical order picker
- 1,200 kg capacity
- 12,345 mm picking height

ETX 513–515:
- Tri-lateral stacker
- 1,500 kg capacity
- 13,000 mm lift height

EFX 410–413:
- High-rack stacker
- 1,250 kg capacity
- 7,000 mm lift height

EKX 410:
- High-rack stacker
- 1,000 kg capacity
- 10,500 mm overall lift height

EKX 513–515:
- High-rack stacker
- 1,500 kg capacity
- 17,000 mm overall lift height

EKX 515a:
- Automatic high-rack stacker
- 1,500 kg capacity
- 14,500 mm overall lift height

ETX 515a:
- Automatic high-rack stacker
- 1,500 kg capacity
- 13,000 mm lift height

The functions

Requirement for warehouse navigation

Transponder technology	EKX	EKS	ETX	EFX	Description
Distance measuring and positioning via transponders	Available direct from the factory for all series.				No positioning markers on the rack. Positioning is carried out via the route assigned to the aisle. Flexibility: Subsequent changes such as additional storage locations are possible and can be quickly implemented in the truck. Data set in a truck can easily be transmitted to other trucks equipped with this technology.

Warehouse navigation includes

horizontal position control system	EKX	EKS	ETX	EFX	Description
Entry direction	●	●	●	●	The truck identifies the various entry directions and automatically compensates for the route measuring differences in the positioning.
Intelligent destination position control	●	●	●	●	Prevention of time-consuming wrong journeys. Example: For standard entry in the drive direction in a dead-end aisle, the truck identifies that the last storage locations in this aisle can only be approached in the load direction and notifies the operator accordingly when the job is placed.
Automatic aisle detection/stop for incorrect entry	●	●	●	●	Wrong journeys and incorrect positioning are avoided. Parameters can be set: Entry into an aisle that does not match the job order is prevented and the operator is notified visually in the display.
Positioning accuracy: Horizontal +/–30 mm	●	●	●	●	Stacking operations/stacking and retrieval of whole pallets. The positioning accuracy depends on the transfer and collection of the pallets. Adjustment runs may be necessary if the pallets are not centred when collected.
Pick-by-Light/optical display and illumination of correct bay	●	●	–	–	Especially in picking mode the reach direction display through Pick-by-Light overrides the normal truck display. This depends on the assembly position of the controls. Example: If the control panel is fitted on the mast side, the operator has to turn their body 180° every time they pick an item. It also allows the overall warehouse lighting to be reduced.
Positioning accuracy: Vertical +/–5 mm	●	–	●	●	Positioning accuracy for stacking operations with and without load.
Positioning accuracy: Vertical +/–20 mm	–	●	–	–	Positioning accuracy for pure order picking mode.
Active reach control in conjunction with load sensing	●	–	●	●	Automatic reach adaptation. Depends on lift height. Load-dependent. Costly "resetting" of the load in the rack or when removing the load from the rack is avoided (however, uneven ground conditions are not taken into account).
Dynamic Control in conjunction with stacking operation and load sensing	●	–	●	●	Height-dependent. Optimised reach movements at the respective height, for fast and secure load depositing. See also "active reach control".
Removal heights dependent on storage location	●	–	●	●	Parameters can be set.

Rack Height Select	EKX	EKS	ETX	EFX	Description
A range of stacking operations	●	–	●	●	Flexibility: From manual to semi-automatic stacking cycles. Stacking/retrieval processes can be modified according to the customer's wishes and adapted to suit the operator. Feedback to the WMS is possible.
With/without load sensing	●	–	●	●	Light optical and/or weight-dependent load sensing can be utilised to optimise the stacking operations. Load-sensing also prevents wrong journeys. Example: stacking order without load already raised.
Main lift/auxiliary lift can be modified and controlled to suit customer requirements in various operations	●	●	●	●	Adjustable main lift Optimised travel height with lowering control depending on: – Ground conditions, goods to be transported and weight – Aisle length and main lift height and PPS (Personnel Protection System) Adjustable auxiliary lift (EKX only) Manual Semi-automatic – Activated by operator Automatic – Route-dependent activation – Non route-dependent activation – If rack heights are higher than the main lift height, the auxiliary lift automatically positions itself

Warehouse navigation includes

Warehouse layout	EKX	EKS	ETX	EFX	Description
Warehouse topology	●	●	●	●	Parameters can be set. Quick and easy mapping of the warehouse layout in the truck controller. Flexibility: Subsequent amendments to the warehouse structure can be accommodated at any time and transmitted to other trucks using the same technology.
Combinations of compartment rack widths and heights can be achieved	●	●	●	●	Rack rows with combinations of rack widths (storage locations) and heights (zones) can be achieved. In conjunction with the customer's own warehouse management system or the Jungheinrich WMS, storage locations and zones can be communicated directly to the truck for processing.
Dynamic storage area management system	●	●	●	●	The dynamic storage area management system can be mapped in the truck. It is controlled via the Jungheinrich WMS or the customer's own warehouse management system.
Changes in the warehouse layout	●	●	●	●	The system is flexible for future conversions. See also transponder technology, Rack Height Select and warehouse topology.

Operation	EKX	EKS	ETX	EFX	Description
Horizontal adjustment runs	●	●	●	●	Parameters can be set. Authorised route for +/– adjustment. Example: – Horizontal adjustment required for order picking (EKS and EKX) using decommissioned goods carriers, for example. – In warehouse operation (ETX and EKX) for pallet position adjustment runs. – No loss of job through adjustment runs.
Vertical adjustment runs	●	●	–	–	Parameters can be set. Authorised route for +/– adjustment. Example: – Vertical adjustment required for order picking (EKS and EKX) using decommissioned goods carriers, for example. – In warehouse operation (ETX and EKX) for adjustment runs due to damaged pallets. – No loss of job through adjustment runs.
Choice of operating mode: Order picking/stacking mode	●	–	–	–	Parameters can be set. – Manual. Automatic via WMS/Jungheinrich WMS. Indicated in the truck display.
Intelligent destination approach	●	●	●	●	Parameters can be set. – Twin lever operation: The operator determines the processes, such as travel and lifting. The truck stops the operations when it reaches its destination. – Single lever operation (two-hand control required for EKS and EKX): The truck computer calculates the quickest way to the target position. If the travel lever is activated, positioning is optimised. This includes all the processes necessary for this: Calculation of the route and of the lift path as well as time optimisation.
Route guidance display	●	●	●	●	The truck display shows the target position with travel direction, lift/lower, stacking or picking direction.
Stacking operation	●	●	●	●	See Rack Height Select.

Safety	EKX	EKS	ETX	EFX	Description
Personnel protection system (PPS), end of aisle control, lift/travel and other safety-relevant cutouts	●	●	●	●	The warehouse navigation functions are subordinated to the safety-relevant cutouts.

Experience	EKX	EKS	ETX	EFX	Description
Practical solutions	●	●	●	●	The warehouse navigation has been state-of-the-art since 2009. Benefit from our experience and visit our reference customers around the world. There is nothing that we have not already done. You can also find reference films on our Jungheinrich YouTube channel.

Key: ● available / – not available

System requirements and versions of the Logistics Interface

The Jungheinrich Logistics Interface is available in two versions: LI and LI Light. These are designed for different operating systems and differ in functionality.

Version	System requirements	Description
Logistics Interface (LI)	– Operating system Windows XP, XP Embedded, 7, 8, 8.1., – Embedded Standard 2009, Embedded Standard 7 or Embedded 8 Standard – .NET Framework 2.0 or higher – A serial interface required (RS232) – At least 800 MHz processing power – At least 512 MB RAM – At least 10 MB free storage space for the Logistics Interface – USB port available for installation and maintenance	The Logistics Interface (LI) is installed as middleware on the radio data terminal. This will require a terminal with the listed system requirements. In particular, the Jungheinrich radio data terminals are recommended.
Logistics Interface Light (LI Light)	– At least .NET Compact Framework 2.0 – Windows CE 5.0 or Mobile 6 – At least 600 MHz processor power, in individual cases lower also possible – At least 20 MB free Flash memory – A serial interface required (RS232) – USB port available for installation and maintenance	The Logistics Interface Light (LI Light) is available for radio data terminals or other devices with Windows CE 5.0 or Windows Mobile 6. The functional scope is reduced compared to the LI.

High flexibility due to various interface options

The Jungheinrich Logistics Interface (LI) offers various options for implementing data exchange with the customer's warehouse management system (WMS). Due to different, defined interface options, the expense incurred by the customer for making changes to the WMS is significantly reduced. The data content is freely selectable for all interface types and must be defined in conjunction with the customer in order to reproduce the processes optimally.

Category	Function	LI	LI Light	Description
Standard interface option WMS to LI	TCP/IP telegram	●	–	The technical details of the connection will be clarified in the interface discussion with the IT specialist.
	ASCII file transfer	●	●	
	JavaScript	●	●	
	Telnet	●	–	
Advanced interface options WMS to LI (on request)	DLL/EXE access	●	–	
	Virtual printer	●	–	
	Web service	●	–	
	Remote desktop	●	–	

Where is the pallet – feedback to the WMS

The Logistics Interface enables feedback to be executed automatically. This means that the WMS is always informed in real time the process step which the pallet is currently undergoing and the extent to which the process has progressed. For example, the WMS can be notified of the arrival of the truck at the bay and then final completion of the stacking or retrieval. How this feedback is activated and what it contains may be freely defined. Examples for content of the feedback: Bay for retrieval or a pallet ID transmitted in the order data.

Function	LI	LI Light	Description
TCP/IP telegram	●	–	The technical details of the feedback will be clarified in the interface discussion with the IT specialist.
ASCII file transfer	●	●	
DLL access	●	–	
Keyboard adapter	●	●	

Graphical user interface

Where users do not wish for an interface with the WMS as they have no WMS or there is no WMS client installed on the terminal, customised graphical user interfaces can be provided.

Function	LI	LI Light	Description
Individual graphical user interface	●	–	Customised display with additional functions such as the saving of transport orders in lists.
Approaching transfer points at the push of a button	●	–	Implementation of special processes, such as the approaching transfer points at the push of a button in the user interface.
Bay input via barcode scanner	●	–	The bay is entered via a barcode scanner or a touch keyboard.
Keypad in the user interface	●	–	Individual keypads for travel functions possible in the user interface.

Any bay numbering

Any numbering of the storage bays which can be understood by the truck can be mapped. The bay numbers known to the warehouse worker are shown in the truck display.

Category	Function	LI	LI Light	Description
Bay conversion	Any numbering	●	●	Complex bay numbering may be converted by the Logistics Interface without restrictions into a format which the truck can understand. For example, block numbering may be cancelled or unsystematic numbering retained (due to continuing warehouse extensions).
	Several names for a bay	●	●	Occasionally, a physical storage location is used both as a goods receipt bay and a goods outward bay and therefore has two names in the WMS. The corresponding conversion and standardisation to a physical space is facilitated.
Truck telegram extension	Display string	●	●	When a bay conversion is used, the operator can still see the original bay designation from the WMS on the truck control panel. This is possible due to the transmission of the text to be displayed (display string) to the truck controller.
	Order display as on-screen display	●	–	New incoming orders can be displayed on an on-screen display on the terminal. As a result, the operator receives visual support when the order was identified by the Logistics Interface and the warehouse navigation is active.
	Lift, travel and stacking offsets	●	●	By specifying the lift, travel and stacking offsets, any bay in the narrow aisle warehouse can be approached. For example, the Logistics Interface facilitates the approach from different stacking depths. The number of different stacking depths is not limited here. Furthermore, operator-specific order picking heights can be transmitted to the truck via the Logistics Interface. As a result, during order picking, the height of the cab is ergonomically adapted to the height of the respective operator, thereby making picking easier for them.

Key: ● available / – not available

Mapping of complex warehouse processes

Complex warehouse processes from the WMS can be mapped by the Logistics Interface LI/LI Light and thereby executed by the warehouse navigation. It is therefore no longer necessary to adjust the processes of the warehouse management system. Consequently, in addition to standard processes such as stacking/retrieval or picking, processes such as empty pallet collection are also possible.

Function	LI	LI Light	Description
Software support of various standard warehouse processes	●	●	The standard warehouse processes such as stacking, retrieval and order picking can be carried out semi-automatically with the aid of the Logistics Interface.
Delete order	●	●	Deletion of an order can be initiated via the WMS.
Relocation	●	●	When the WMS operates in one stage, a relocation order can be converted by the Logistics Interface into a two-stage retrieval and stacking order.
Approaching the bay	●	–	The truck approaches a bay without an associated stacking operation.
Restacking at last picking location	●	–	In some WMS, the size and weight of picking positions are not used to distinguish between goods-to-man and man-to-goods. Should an operator take the pallet to the transfer station for the picking of large or heavy items, the load carrier can be returned to the original position at the touch of a button without control by the WMS.
Empty pallet collection	●	–	In an order picking warehouse, the collection of empty pallets may be necessary. At the end of a shift, pallets which have been emptied during the course of the shift are stacked using the empty pallet collection process and collected in the empty pallet store.
Turning requirement	●	–	Turning the forks at a particular location in the warehouse, if turning in the aisle when carrying a load is not possible due to the dimensions.
Retrieval or stacking dependent on load sensor	●	–	Stacking or retrieval can be dependent on the load sensor. When this function is selected, stacking or retrieval is carried out with a load on the forks. The WMS must therefore not distinguish between the types of order.
Position detection	●	–	The WMS can check the current truck position at any time. If the truck is detected in the narrow aisle, the position is reported back to the WMS.

Key: ● available / – not available


06
08
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12
JUNGHEINRICH

Yes or no?
Investment decisions are simple, but not straightforward. We compile the facts that make it easier for you:

BestInvest
Our warehouse and system trucks reduce your operating costs in the long term by up to 20 %. With a wide range of technological and ergonomic advantages that reduce the expenses making up the Total Cost of Operations (TCO) to minimum levels, from purchase to disposal – we call this promise BestInvest. It helps you transform your costs into profitable investments so that you can make the best investment decision.

Explosion protection for hazardous areas
Many industrial sectors are subject to a high level of explosive hazard due to flammable gases, fumes, powder or dust. To meet these special requirements and to guarantee safe operation, we can supply explosion-proof electric fork lift trucks in accordance with Directive 94/9/EC (also referred to as ATEX 95).

Warehouse navigation can be retrofitted at any time
The inclusion of the warehouse navigation in your IT infrastructure or your warehouse management system is possible at any time. Whatever your plans – we'll be with you every step of the way.

The right racking for the right truck
We can provide you with the complete solution for this: Integrated warehouse planning, where the racking and the trucks work "hand in hand" as part of a single system. From project planning through CAD drafting to handover. From modular racking systems through system platforms to high-bay racking. From consultancy through installation to service. We offer a one-stop shop. Why not see for yourself in one of our 800+ reference plants worldwide?

Your one-stop energy provider
More energy through synergy. In keeping with this motto, we can offer you trucks, batteries and chargers from a single source. A system adapted 100 % to your operating conditions. The advantage: Maximum truck availability and an economical energy supply designed for specific needs. Your batteries, your budget and the environment will thank you.

Recovering energy
Our warehouse and system trucks do not just save energy, they also recover it. The motors serve as energy sources both for regenerative braking and load lowering. They feed current back into the battery and immediately provide energy for other operations. The advantages: Outstanding energy management and lower wear on components such as brakes.

Controlling energy
The computer system does not just control the truck and its performance, it also coordinates the flow of energy, thereby providing an active energy and battery management system. As a result the battery is not overloaded, remaining within the effective range even at times of high performance. The advantages: Outstanding efficiency and maximum useful life of the battery.

Saving energy
Extremely long uptimes – up to two shifts – with a single battery charge: This has always been the strength of our warehouse and system trucks. Despite higher dynamics with up to 20 % faster pallet throughput, you will use up to 10 % less energy. An equation which will re-energise your intralogistics!

100 % customised vehicles

Special applications require special trucks. This is especially true for factors to which the standard trucks cannot easily adapt, such as company-specific transport operations, unusual goods or complicated layouts. We offer customised adaptations for specific applications. Quality and cost-effectiveness from series production are combined with your personal requirements. The consistent modular design of our entire product line makes this possible.

In-house financial services

We offer you a wide range of tailored solutions to suit your commercial, financial and balance sheet requirements – even if these should change over time. This will allow you to keep on the move and respond flexibly. Your area sales manager will be happy to work out which solution is best suited to your needs.

Service with the manufacturer's expertise

Benefit from our service. Benefit from the manufacturer's expertise. With our full service offer, our individual maintenance intervals, and much, much more, you will be convinced by the diversity of our service, which is flexibly adapted to your specific application. In this way our service provides you with long-term investment and planning security. Our comprehensive direct sales network and superbly trained engineers ensure rapid response times, minimum downtimes and low operating costs.

Advantages

- Competent and comprehensive consultancy.
- Short communication channels and rapid response times.
- Short downtimes to save you money.
- First-class training of the service technicians.
- Efficient spare part logistics with 98.5 % spare parts availability.
- Preserve the value of your trucks with original spare parts.
- Increased operational safety and reliability.

The whole is greater than the sum of its parts

Our service department has exclusive access worldwide to original spare parts. Using only original spare parts is the only way to maintain optimum interaction between all components, ensuring maximum reliability and preserving value. Only our original spare parts meet the high performance requirements of the truck and material and secure your complete warranty claim.

Double digit decrease in CO_2emissions over ten years

We have drastically reduced CO_2emissions for our entire truck range over the last ten years, by more than 25 % for electric and diesel/LPG fork lift trucks. and by more than 35 % for vertical order pickers and narrow aisle/reach trucks. We have done this with a series of technological innovations which are currently setting standards for CO_2 emissions.

Significantly reduced CO_2 emissions also mean significantly lower energy costs

Our entire product cycle now features technological innovations for reducing CO_2 emissions, from manufacturing through usage to reconditioning. And our high-tech solutions are really setting standards in the usage phase which is where more than 80 % of all emissions occur. You can easily use this advantage to your benefit, immediately reducing your energy costs considerably while simultaneously achieving maximum throughput rates. www.jungheinrich.co.uk/BestInvest

TÜV-certified product life-cycle assessment

TÜV-Nord has systematically analysed the life-cycle assessment and certified it in accordance with DIN EN ISO 14040, giving us the environmental rating "Geprüfte Produkt-Ökobilanz" [Certified Product Life-cycle Assessment].

With night express delivery, all spare parts can be delivered directly in our service engineers' vans so they reach you by next morning.

ISO 9001
ISO 14001

The German production facilities in Norderstedt and Moosburg are certified.

CE

Jungheinrich trucks conform to the European Safety Requirements.

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