



VNA

Engineered for your performance
Linde solutions for VNA applications

Linde Material Handling

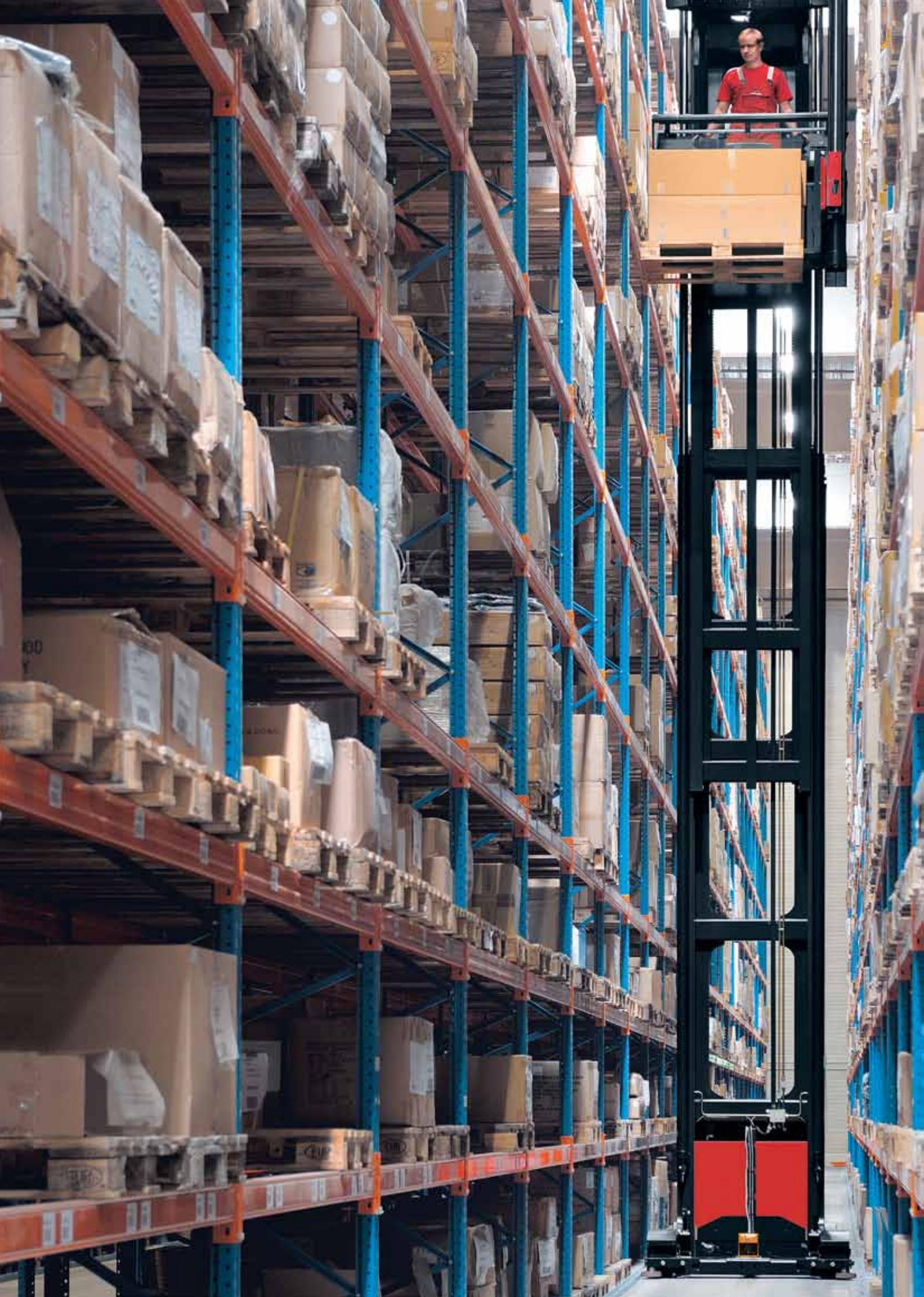
Linde

Very Narrow Aisle – the ideal
solution for optimum storage

VNA means you can handle

- more goods
- in less time
- in less space
- with less damage

Resulting in higher performance



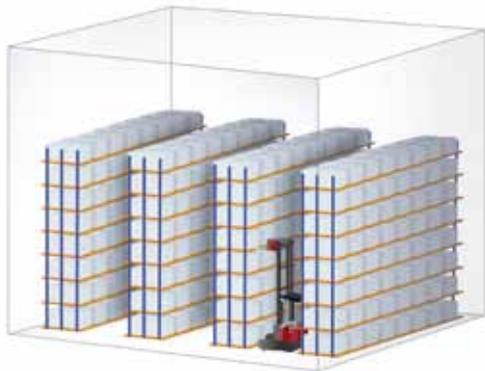
The ever-growing need for more **efficient** use of **space** has led many companies to switch to **Very Narrow Aisle (VNA) solutions**.

VNA installations can cope with both full pallet handling and order picking. At the same time an efficient way of organising the internal flow of goods is provided so **higher throughputs** can be achieved.

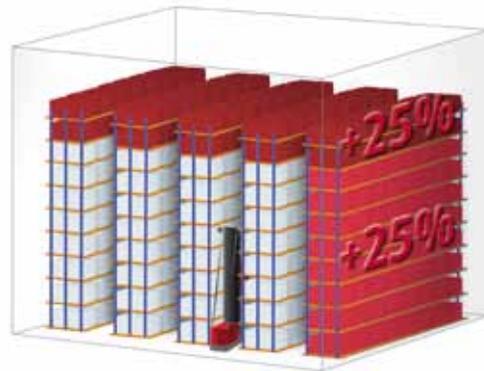
Your benefits of VNA solutions at a glance

Space. VNA is a highly effective option when planning a new warehouse to achieve the optimum use of space. When remodelling a conventional warehouse, a VNA solution can also pay off especially when pallet throughput increases significantly or when more storage capacity is needed.

Space saving in detail: Whereas conventional warehouse trucks require aisle widths of over 2.7 m, the aisles in a VNA warehouse measure around 1.7 m. This alone represents a space gain of some 25%. However VNA racking can also be built substantially higher enabling operators to work at up to 17 m thereby achieving the greatest storage density possible. With standard pallet loads over 50% more can be stored in a Very Narrow Aisle warehouse if roof heights permit.



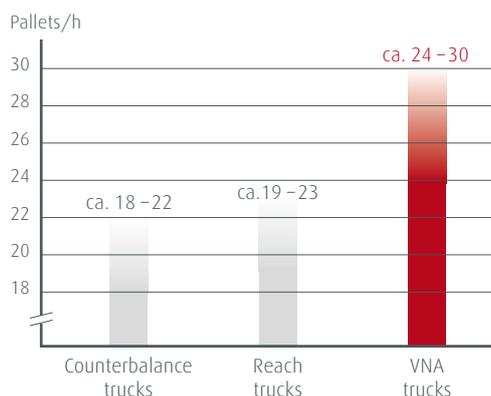
A conventional warehouse with Reach trucks requires an aisle width of over 2.7 m.



VNA solutions enable up to 50% more pallet storage compared to a conventional racking system.

Performance. VNA warehouses enable extremely efficient organisation of workflow, high throughput and optimum pallet density. Being capable of traction and lift simultaneously, a VNA truck has a substantial advantage over other truck types. This diagonal movement allows the operator to retrieve a pallet from a height of 10 m in the same time that he could transport a pallet at ground level with another type of truck. This leads to savings in time and a substantial increase in efficiency.

Performance Level of different truck types

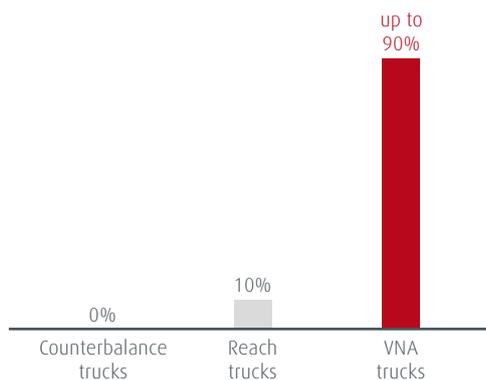


Assuming a racking beam height of 6 metres and an average work efficiency, counterbalance trucks can move around 18 - 22 pallets per hour. Reach trucks can handle around 19 - 23 pallets per hour (but only 16 in Drive-In racking and only 13 in double deep). By contrast, VNA trucks achieve by far the highest performance handling 24 - 30 pallets per hour.



Safety. VNA provides the maximum security in pallet handling resulting in considerably less product and racking damage. Thus VNA solutions are ideal, if high value goods are handled and damage costs are causing problems. By being on the same level when storing pallets with a guided truck, damages can be significantly reduced.

Cost reduction due to VNA truck use



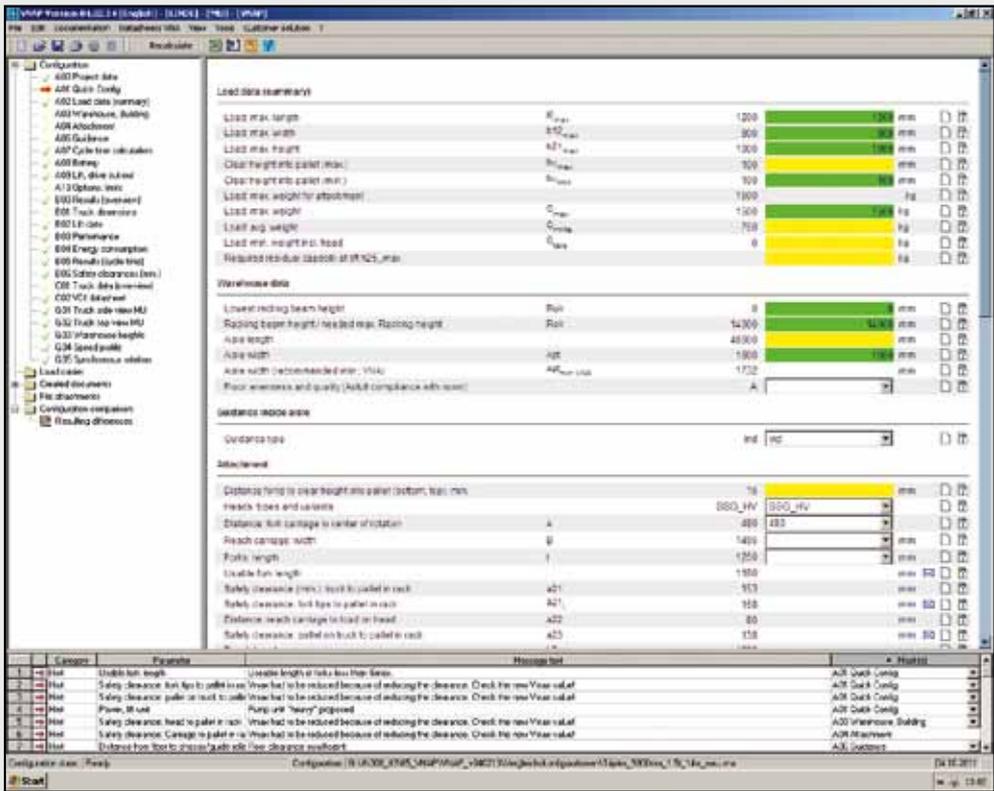
Depending on the truck type, product and rack damage differ. The percentages shown are the maximum cost savings that result from replacing different truck types. By using a VNA truck, the costs resulting from damages can be reduced by up to 90%.

The VNAP software allows a quick and reliable configuration of your truck

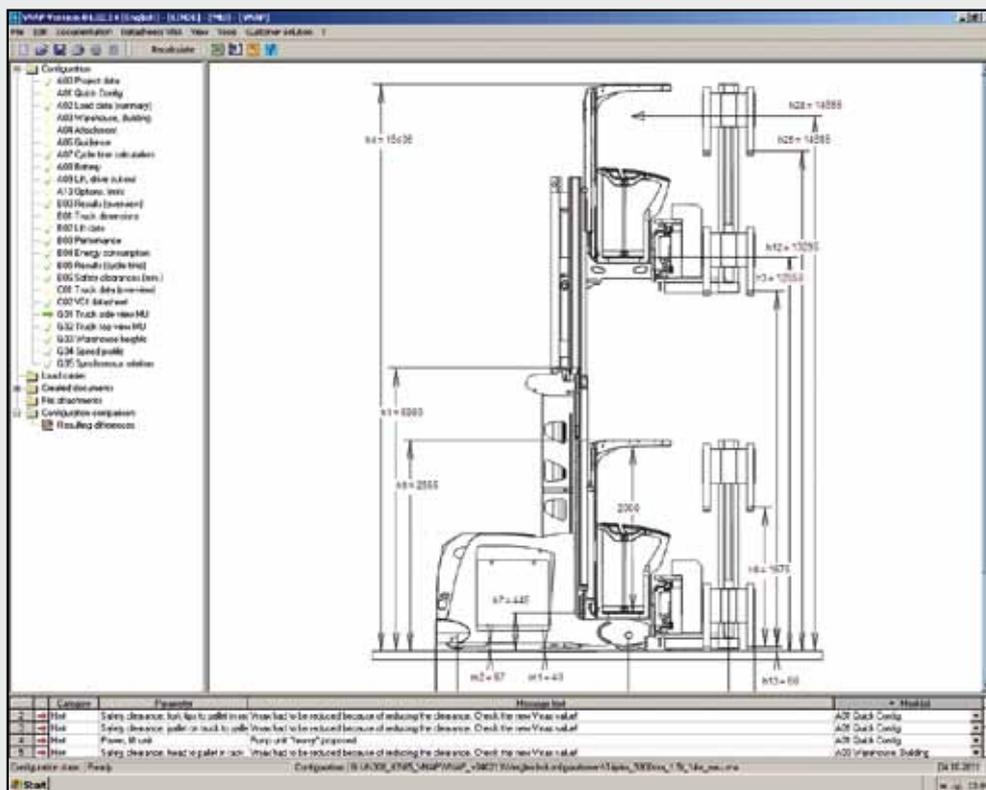
In Very Narrow Aisle applications the interaction between different parameters such as trucks, floors, racks etc. is crucial. Each parameter can have a huge influence on the truck's performance. The Linde Very Narrow Aisle configuration programme (VNAP) helps to create the perfect solution for the application by giving total transparency of the truck specification at every step of the project.

The VNAP software analyses the site, its constraints and the application requirements. Then you select – on screen – the exact details of your future truck. Whether your application involves high or medium throughput, medium or high lift heights, light or heavy loads, order picking or full pallet handling – or a combination of these: Linde's Modular Concept can meet all your needs.

Linde's specialist VNA sales staff will work with you to identify the optimum configuration to meet your operational and storage needs and select the most appropriate cabin option, performance package, mast, battery and chassis size. Our staff can produce the drawings for you in your office resulting in the perfect tailor-made solution.



In order to create the perfectly adapted truck, all relevant warehouse and application data needs to be collected. Starting with the load dimensions, the racking details, type of guidance, battery size etc. all information is put into the software tool.



After collecting all relevant data, the final truck specification is displayed by the software. The software also generates the aisle dimensions, the achievable performance data, the energy consumption, etc. on the spot.

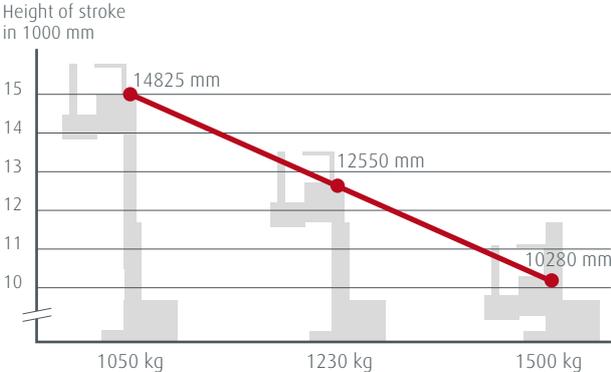
High precision for speed and performance: Linde System Control (LSC)

Linde has developed innovative technology to ensure optimum control of the performance of its VNA man-up and man-down trilateral trucks. A standard truck is unable to distinguish whether it is carrying a load or not and thus it needs to be slowed down when lifting in order to retain stability. Linde’s VNA trucks, however, are equipped with sensors, which, thanks to Linde System Control (LSC), provide the optimum truck speed. This speed is actually calculated in real time in relation to the weight of the load on the forks and the height of the forks. This means that the truck only slows down when it is carrying heavier loads. A responsive electronic monitoring system enables the operator to achieve maximum productivity while driving in the aisle and handling loads. Depending on the specific operating conditions, trucks equipped with LSC can deliver up to 25% higher performance than conventional machines.

The major benefits of Linde System Control (LSC) are a significant increase in safety, higher load throughput and less damage to trucks and loads.

To ensure the highest levels of productivity, Linde trucks can be provided with additional options: a height pre-selector system, as well as automatic reach and rotation of the forks, both contributing to faster and safer load handling.

Dynamic residual capacity

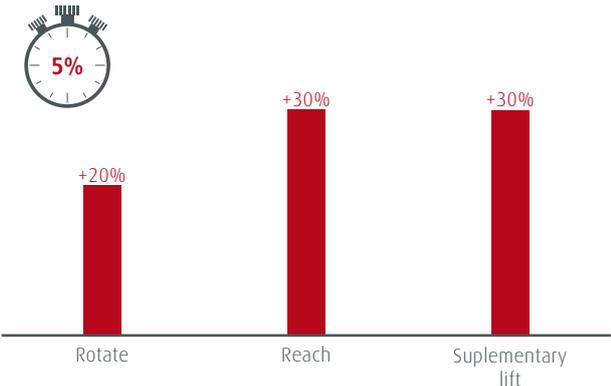


LSC Standard – Dynamic residual capacity:

The display always shows the actual capacity depending on the current height of the forks. Reach and rotate movements are optimised depending on the actual lift height.

Benefit: Full transparency of actual truck capacity depending on height plus enhanced safety

Load Recognition

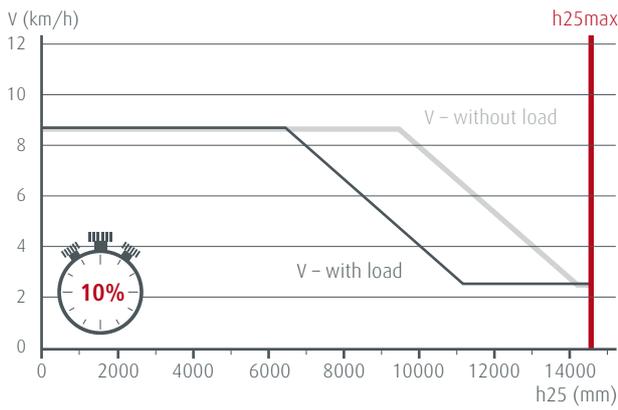


LSC 3.1 – Load recognition:

A sensor indicates if a load is on the forks. In this way operating functions such as reach, rotate and supplementary lift are optimised – up to 20 – 30% faster when working unladen. Acceleration and speed are adjusted depending whether there is a load on the forks.

Benefit: Throughput improved by up to 5%

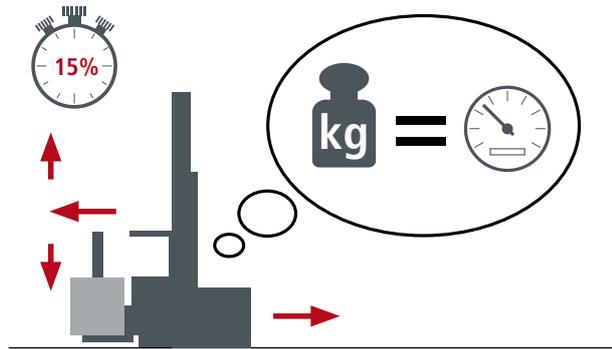
Speed Profile (max.)



LSC 3.2 – Load sensor:

This sensor provides the same optimisation as load recognition (LSC 3.1) but the driving parameters are also optimised. Depending on load, the truck has either faster or reduced traction speed.

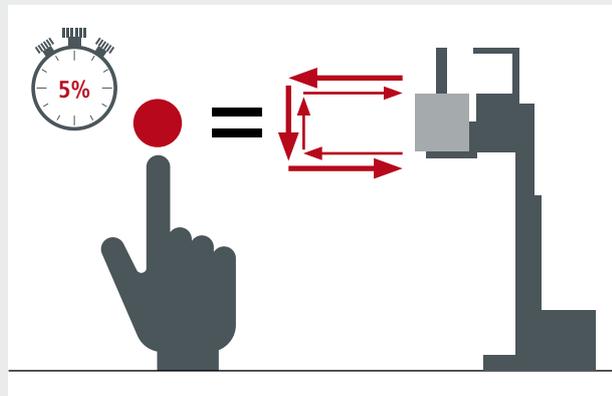
Benefit: Throughput improved by up to 10%



LSC 3.3 – Weight sensor:

Thanks to the weight sensor, the truck recognises the weight of the pallet and optimises all truck operations in relation to the specific pallet weight. This function gives a particular benefit if pallets of different weights are being handled.

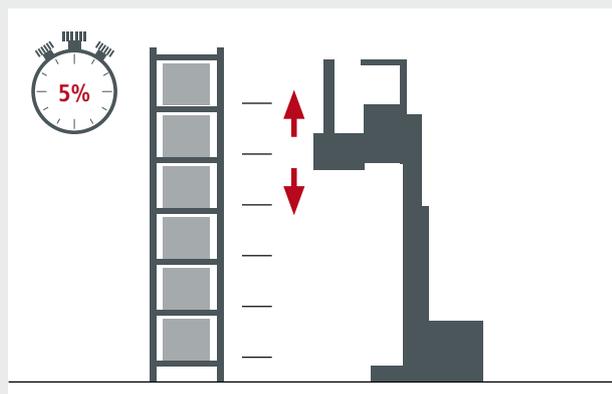
Benefit: Throughput improved by up to 15%



Supplementary option – Automatic fork cycle:

The automatic fork cycle allows comfortable and fast storage and retrieval of pallets. Reach out, placing/retrieval and reaching back are done automatically as a continuous cycle controlled by single button.

Benefit: The storage process is accelerated by about 15% and throughput is improved by up to 5%



Supplementary option – Lift height preselection:

With the lift height preselector, the different rack heights in the warehouse can be easily entered into the system memory. The driver then only needs to enter the next rack destination and the forks will be raised to the required height. Combined with load recognition and load or weight sensing (LSC 3.1 – 3.3), the truck knows if a pallet is already on the forks and thus stops +100mm above the rack if a pallet is to be stored or at pallet height if it is to be retrieved.

Benefit: The correct beam height is reached nearly twice as fast and throughput is improved by up to 5%

Aisle safety system

Operator assistance systems are important for the safety of the warehouse and the operator himself. Depending on the requirements, different functions and systems such as reflectors, magnets, barcodes or RFID can be chosen.



RFID



Magnet



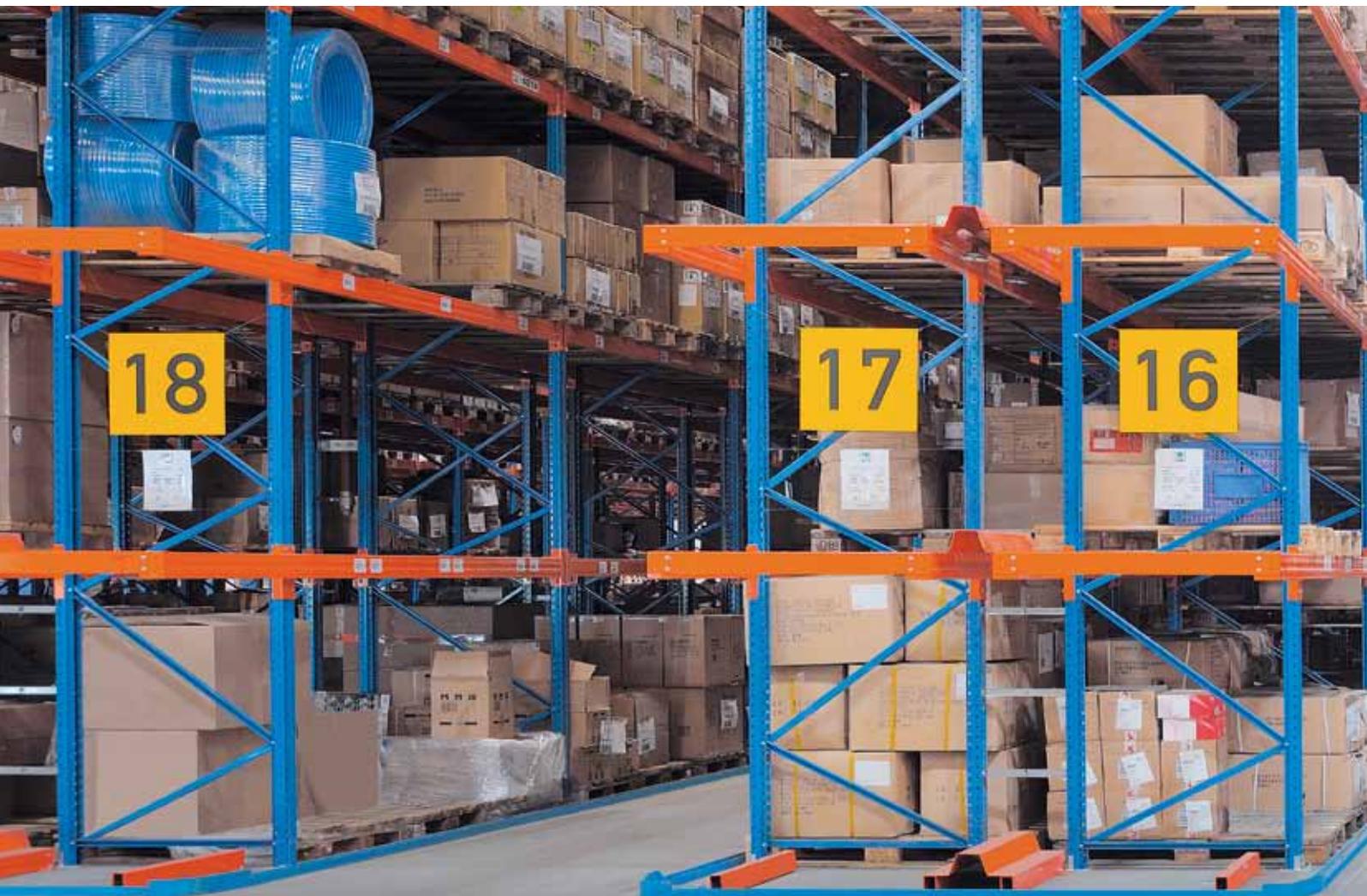
Reflector



Barcode

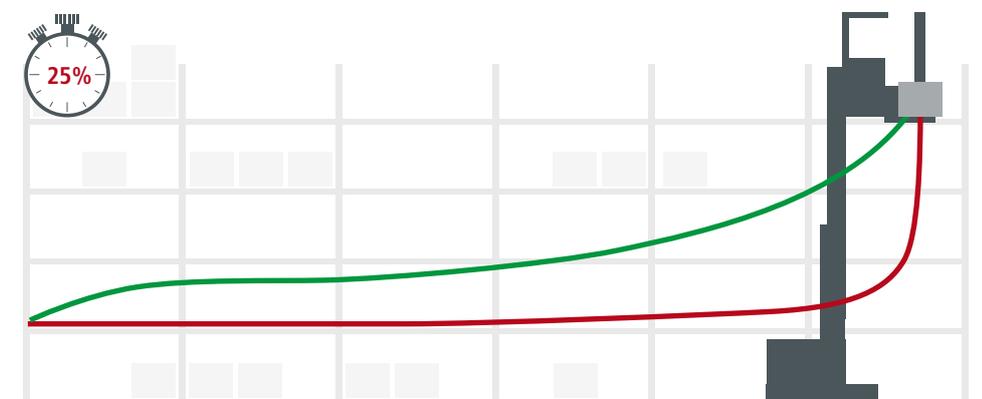
End of aisle braking: In order to exit an aisle safely or to stop at a wall, the VNA truck has an integrated safety system, which reduces the speed of the truck or stops the truck completely.

Zone recognition: Due to building restrictions in some areas of a warehouse, the truck will not always be allowed to work with full functionality (lift, speed, etc.). A common restriction is a height restriction caused by lights or roof trusses only in certain aisles etc.

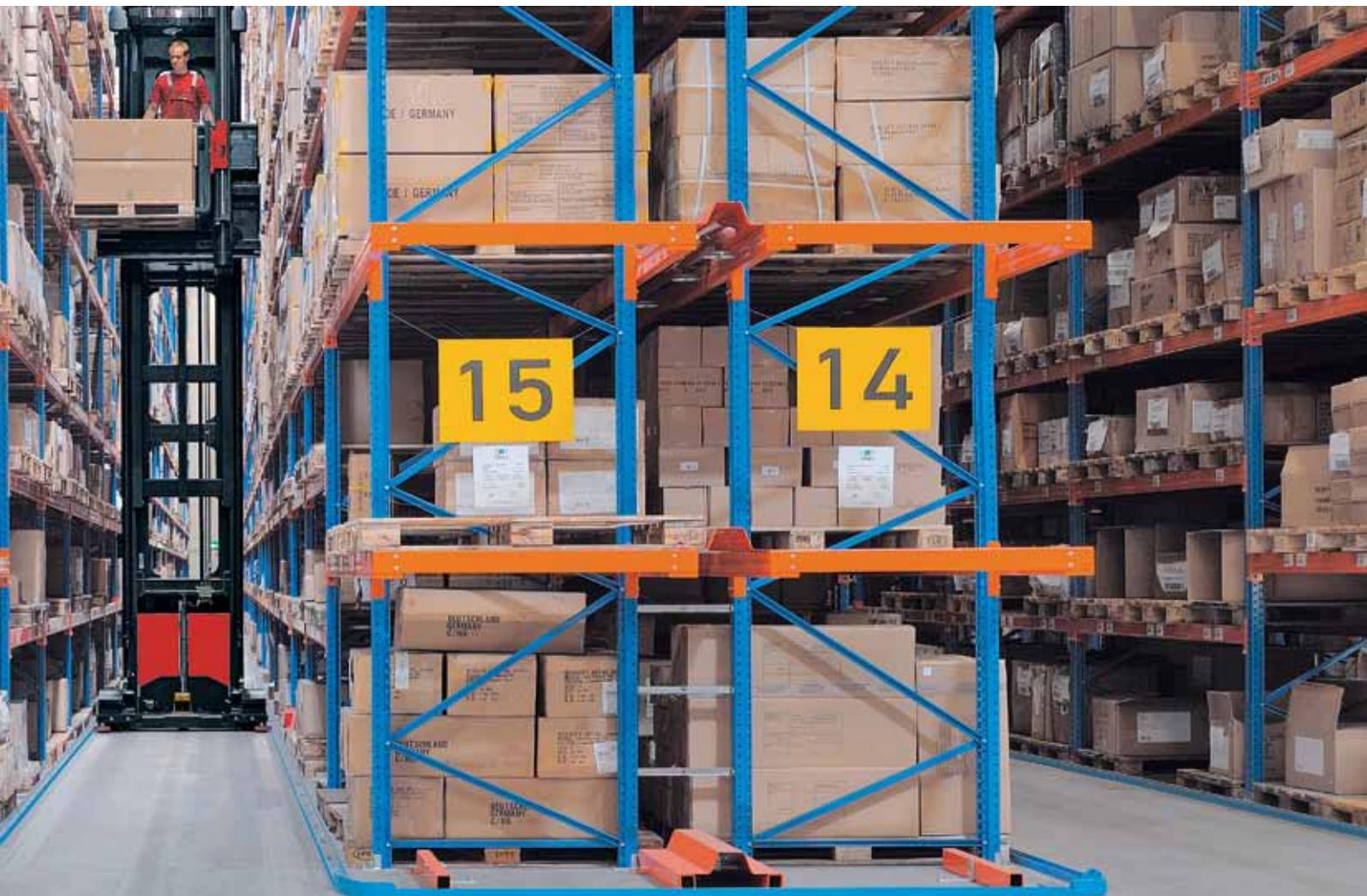


VNA Navigation: Safety and speed in pallet handling need not be in conflict. With the Linde VNA navigation system the throughput can be increased and, at the same time, safe pallet handling can be ensured as mistakes are avoided. When receiving the information on the location that the next pallet needs to be stored in or retrieved from, the truck reaches this pallet position by the fastest possible route and only allows storage or retrieval at this one pallet location thus avoiding mistakes.

Time saving with VNA Navigation



Optimised operation with storage navigation provides a time saving of up to 25%. The green line shows the shortest time using the fastest route and with as little energy used as possible.



Trucks available for VNA applications

Linde's expertise in designing trucks for VNA applications and its modular approach make us your ideal partner. With its two ranges, Linde has a solution for all situations and, using its exclusive VNAP software, Linde trucks can be customised to meet your need for optimum performance. Our man-down "A" range is designed for storage and retrieval of pallets at lower heights. Our man-up combi "K" trucks are best-suited for storage and retrieval in high bay warehouses with greater throughput needs and where order picking is required.

The Linde Man-up combi "K" range.

The Linde "K" range man-up trucks are the perfect solution for all VNA warehouse applications. These modular combi trucks are designed for high level full pallet storage and retrieval as well as case picking applications up to 17 m.



The Linde man-down "A" range.

The Linde man-down "A" range. Linde's "A" range modular man-down trucks is designed for fast, reliable storage and retrieval of full pallets. This entry model for smaller VNA applications can work at heights of up to 10 m.



The Linde custom-built man-up combi range will meet your VNA needs

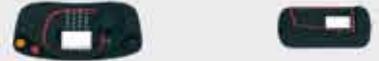
Not all warehouses are the same. This is why customer requirements for VNA trucks vary so greatly. Mast lift height, battery capacity, the cabin configuration, etc.: Only the right combination of these equipment choices – which may seem trivial at first sight – is capable of coping with your demands and offering you optimum efficiency. For this reason Linde’s man-up combi “K” range was conceived from the beginning as a modular range. Many of these interesting options are also available on our man-down “A” range. Linde’s specialist VNA sales staff will work with you to identify the optimum configuration to meet your operational and storage needs and to select the most appropriate tailor-made solution.



Masts: The ideal mast for your task depends on the application – are your loads light or heavy, do you store pallets at medium height or up to 17 m. Linde has mast solutions for every requirement.



Five different cab versions: Designed to ensure more space and greater freedom of movement. Whether your operator needs a better view of the forks or the goods to be handled are bulky so that you need a wider cab or even if the store is chilled or cold: Whatever your requirements, the truck can be equipped with a cabin that meets every one of them.



Control concept: Two different control concepts can be chosen depending on the truck application.



Power packages: Depending on the working heights and throughput rates you need, the truck can be equipped with different traction and lift speed combinations.



Load handling and truck guidance: If your handling operations mainly involve full pallet loads or case picks, and if better use of available storage space is an objective: The Linde Modular Concept provides the solution with either a rotating turret head or telescopic forks and with either rail or wire guidance in order to match the operational criteria of your existing facilities or a planned new site.



The optimum chassis size: Compared with conventional combi trucks, Linde trucks are extremely robust, torsion-resistant and compact allowing a reduced chassis length. They set new standards in rapid guide wire acquisition and aisle transfer in order to reduce end-aisle widths.



Batteries: Duration of normal working shifts, weight of loads, throughput ratios: all these are factors that define the optimum battery capacity. Whatever your standards are, we can equip your truck with exactly the right battery for you.

Equipment options for the man up-combi “K” range cabin

The equipment fitted to Linde’s man up-combi “K” range base model already offers significantly more comfort to the operator than average competitor models. This is because the more comfortable the operator is, the more effectively he will work. It starts with easy on/off access. The ergonomic kneepad enables convenient working when standing.

Furthermore, we can offer you interesting supplementary equipment options, which can be fitted to a strong, durable mount.



Step in: Low step-in height for easy on/off access



Best ergonomics through knee pad: Comfortable and ergonomic placing of picked goods on to the pallet



Flexible mounting and storage system: The mounting system allows individual attachments such as monitors and scanners, and Linde attachments such as storage utilities, clipboard, etc. to be integrated into the truck cabin



Storage: Convenient storage for bottles, work equipment, etc.



LED: The bright LED working lights guarantee good visibility into the racks. Powerful ventilation fans are adjustable in two steps



Mirror module: Best visibility onto guide rollers and over truck rear



Further equipment options for the cabin

Linde gives you the possibility to adapt the cabin completely to your needs. Is your warehouse heated? Is there a high percentage of order picking involved?

You can choose the cabin access depending on your personal requirements. The side barriers are designed to be very strong and to open easily for convenient on/off access. The comfortable cushioning supports the operator when he is leaning over the barriers.

The optional glass doors are especially valued when working in unheated warehouses as the operator is sheltered from wind and drafts.

The tilting barrier gives more space for order picking when goods are located at the back of the pallet. The operator can reach about 50 cm deeper into the pallet by tilting the barrier. Perfect to guarantee safety, the barrier only tilts when the truck is stationary and traction is only possible when the barrier is tilted back.



Lateral barriers: Comfortable order picking with cushioned barriers



Order picking barrier: Tilting barrier for better access to cases at the back of a pallet optimising picking reach by approximately 50 cm



Glass door: Comfortable working environment due to wind and drafts being deflected



Two handling concepts to suit every application

Modularity and the flexibility to suit the needs of every application are important requirements. Linde offers two different handling systems to serve these individual needs.

The ergonomic Linde Control Panel guarantees comfortable operation and high throughput. Safe, two-handed operation of the truck is always assured via contact sensors. All functions are easily within the reach of the operator.

Standard or Split Control Panel: Changing from seated to standing operation is quick and easy.

Standard Control Panel



The front Control Panel can be easily adjusted for height, distance and tilt to suit each operator. The display shows all relevant truck operating data



Standing operation with front control panel for casual order picking



Seated operation for relaxed full pallet handling

Split Control Panel



The control units can be quickly adjusted from standing to seated operation. Two-handed use is always assured via contact sensors



Standing operation for frequent order picking



Seated operation for relaxed full pallet handling

The Linde man-up combi “K” range. Modular build to give you your very own tailor-made solution

Comfort. Linde’s man-up trucks provide the highest standard of comfort, safety and reliability. We are an operator-focused manufacturer: Operators immediately feel at ease as soon as they drive a Linde “K” truck. We strongly believe the more comfortable, functional and ergonomic the truck is the more relaxed and efficient the operator will be. Features such as the glass front panel and doors ensure excellent visibility for the operator and protection against wind and drafts.

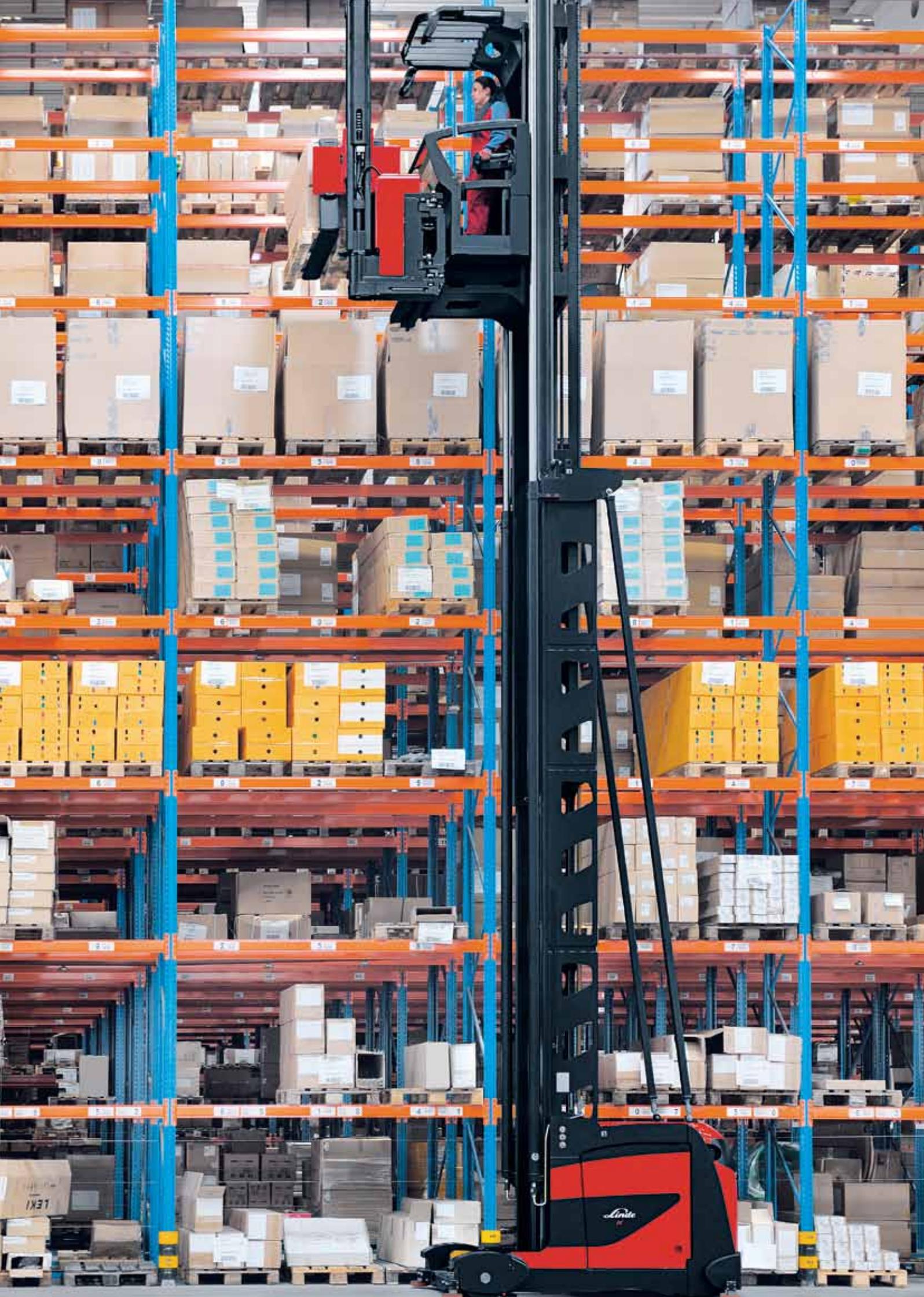
Safety. The control console was designed to be safe and intuitive to operate with a well-organized display and touch sensors to ensure two-handed operation. The status of options such as Personal Safety Equipment or wire guidance is displayed on the operator’s control console. Along with LSC for speed and stability control, Linde “K” trucks benefit from two independent braking systems: electric regenerative braking activated when the operator’s hand releases the accelerator or changes direction; and a two-stage electromagnetic spring-loaded parking and emergency brake acting on the motor shaft.

Reliability. Linde’s “K” range is exceptionally reliable, and requires very little servicing and maintenance. The optional GPRS service is an on-line diagnostic feature enabling the truck to report a fault directly to a technician via SMS.

Productivity. The modular design ensures a tailor-made solution for each application. The cabin is ergonomically designed to ensure that the operator has excellent visibility of the pallets when seated.

Energy. The energy recovery system ensures a long battery shift life. The lifetime of the battery is extended through intelligent energy control which manages the maximum battery current draw.





Equipment options for Linde man-down "A" range

Apart from the different equipment choices such as masts, traction and lift, power packages, etc. we can also equip the cabin of your man-down "A" truck with a variety of interesting options. The base model is already equipped with a special hydraulically damped seat and an innovative joystick control. Other options such as a video camera or twin pedal control can be chosen to meet your needs.



Seat: Hydraulically damped seat with lumbar support. Flexible and adjustable for visibility when placing or retrieving pallets. Available with a heater option.



Joystick control: Easy, one hand operated joystick controls all relevant functions leading to advanced performance



Storage: Variety of useful storage compartments



Video Camera: Best vision for pallet storage and retrieval at height



Radio preparation for a comfortable working environment



Laser Pointer: Faster positioning of load due to Linde Laser pointing system



The Linde man-down “A” range for optimum storage efficiency in Very Narrow Aisles

Modularity. The “A” range benefits from Linde’s operator-focused design. Ergonomics and comfort are the key words. The operator’s compartment is designed to meet his needs, and to enable him to accomplish his tasks. The adjustable seat and pedals have been designed to ensure a fatigue-free operating position so that the operator can focus fully on his tasks. The joystick makes operations easy as all functions can be accessed without changing hands. This ensures both comfort and high performance.

Safety. A range of different functions, such as the optional camera system for driving and stacking, guarantees safety. The optional laser pointer shows the operator the exact position of his forks and helps him to stack or retrieve pallets quickly and safely.

Reliability. Linde’s man-down range is built using the latest AC technology. The trucks are well-protected and encapsulated. The sealed maintenance-free motors are extremely durable. But in the event of a fault the optional GPRS service ensures a quick solution.

Productivity. The sideways-seated driving position helps the operator achieve high pallet throughput. Powerful traction and lift motors guarantee high performance and productivity. Thanks to the Linde System Control (LSC) the optimum performance is calculated in real time in relation to the load carried – a great advantage for maximum throughput.





Linde Material Handling ranks among the world's leading manufacturers. This position has been justly earned. Linde trucks excel not only with their recognized innovative technology but especially their low energy and operating costs, which can be as much as 40% less than competitors.

High quality in production is matched by the standard of the services we provide. With a comprehensive network of local sales partners, we are at your call around the clock and around the world.

Your local Linde partner offers you a complete single-source package. From qualified pre-sales consulting through the sale to after-sales service; including finance packages matched to your business requirements. Leasing, rental or hire purchase. Flexibility is maintained in your operational and decision-making processes.

Engineered for your Performance