

Linde Material Handling

Linde

VERY NARROW AISLE

Linde solutions for VNA applications
For your performance





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 organizing the internal flow of goods is provided so **higher throughputs** can be achieved.

→ [http://www.linde-mh.com/en/Products/
Very-Narrow-Aisle-Trucks/](http://www.linde-mh.com/en/Products/Very-Narrow-Aisle-Trucks/)

YOUR BENEFITS OF VNA SOLUTIONS AT A GLANCE

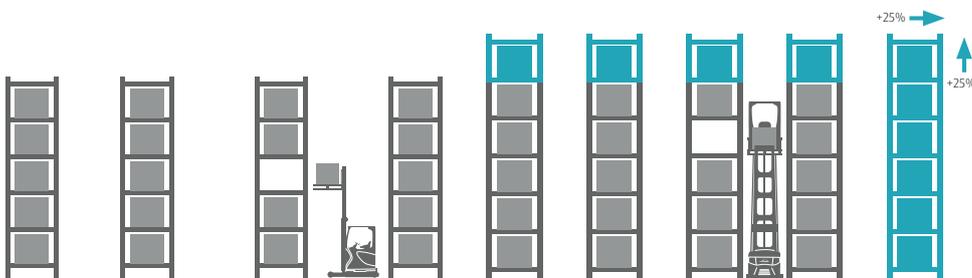


SPACE

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 18 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.



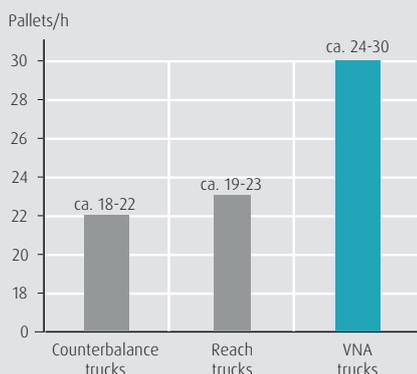
A conventional warehouse with Reach trucks requires an aisle width of over 2.7 m.

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

PERFORMANCE

VNA warehouses enable extremely efficient organization 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



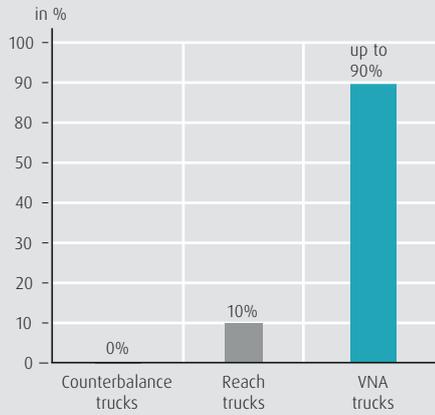
Assuming a racking beam height of 6 meters and an average work efficiency, counterbalance trucks can move around 18 – 22 pallets per hour. Reach trucks can handle around 19 – 23 pallets per hour (but only 16 in Drive-In racking and only 13 in double deep). By contrast, VNA trucks achieve by far the highest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



new.vnap* - VNAP 10.0 (V00.01.00) - LINDE - AO

Suche: Maske, Parameter...

Suche in Ansicht

Beschreibung	Ident.	Out	In	Einheit	Bemerkung
A01 Quick Konfig.					
Lastdaten (Zusammenfassung)					
max. Länge inkl. Überladung	l6 _{max}	1.200	1200	mm	
max. Breite inkl. Überladung	b12 _{max}	800	800	mm	
max. Höhe inkl. Überladung	h21 _{max}	1.000	1000	mm	
max. Unterfahrhöhe	hU _{max}	100		mm	
min. Unterfahrhöhe	hU _{min}	100	100	mm	
zulässige max. Belastung Anbaugerät		1.500		kg	
maximales Lastgewicht	Q _{max}	1.000	1000	kg	
durchschnittliches Lastgewicht	Q _{mitte}	500		kg	
Gewicht der zusätzlich fest installierten Anbauten	Q _{para}	0		kg	
Resttragkraft soll: bei Gesamthub h25 _{max}				kg	
Erhöhung der Resttragkraft (ohne Zusatzgewicht) zu Lasten der Bodenfreiheit		nein			

Validierung Änderungshistorie Ad hoc Vergleich Letzte Änderungen

Parameter	Ident	Wert (alt)	Wert (neu)	Einheit	Status
Gesamthub für Q _{max} gesucht	h25 _{Qmax}	0	10.735	mm	
Ist die Standsicherheit nach Norm erfüllt?		nein	ja		
Kippberechnung noch aktuell?		nein	ja		
max Tranchföhigkeit(Gesamthub)		1000,0	1000/10735	kn/mmm	

MU - 00.00.00 - MU_20170619.1.1.:

Quick Configuration

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.



new.vmax* - VNAP 10.0 (V00.01.00) - LINDE - AO

Suche: Maske, Parameter...

Suche in Ansicht

A06 Führungssystem

Zwangsführung

Führungsart	mech				
Zwangsführung nach Bild	3a/c				

Schiene

Lichte Schienenweite	b26	1.800	mm	
Schienenhöhe		100	mm	

Bodenabstände

Parameter	Ident	Wert (alt)	Wert (neu)	Einheit	Status
Gesamthub für Omax gesucht	h25 _{Omax}	0	10.735	mm	
Ist die Standsicherheit nach Norm erfüllt?		nein	ja		
Kippberechnung noch aktuell?		nein	ja		
max. Tragfähigkeit/Gesamthub		1000,0	1000/10735	kn/mm	

Master Konfiguration

MU - 00.00.00 - MU_20170619.1

Type of guidance

After collecting all relevant data in the quick configuration more detailed information e.g. guidance can be specified. The software also generates the aisle dimensions, the achievable performance data, the energy consumption, etc. on the spot and the final truck specification is displayed by the software.



HIGH PRECISION FOR SPEED AND PERFORMANCE: LINDE SYSTEM CONTROL (LSC)

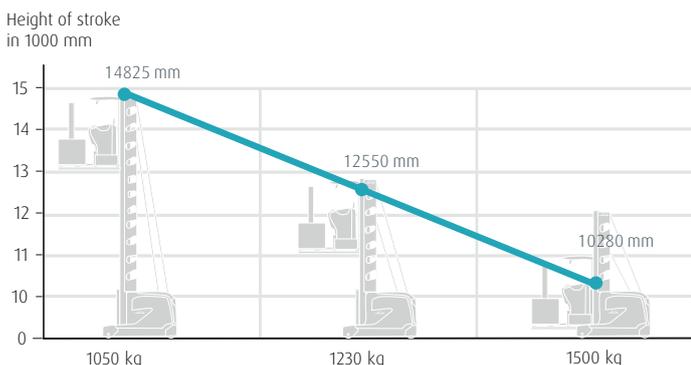
Linde has developed innovative technology to ensure optimum control of the performance of its VNA man-up and man-down trilateral trucks. A standard truck is unable to distinguish whether it is carrying a load or not and thus it needs to be slowed down when lifting in order to retain stability. Linde's VNA trucks can be optional equipped with sensors, which, thanks to Linde System Control (LSC), provide the optimum truck speed.

Linde's VNA trucks 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

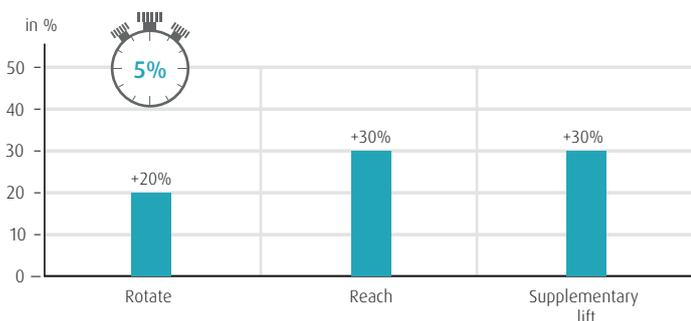


LSC STANDARD:

The display always shows the actual capacity depending on the current height of the forks. Reach and rotate movements as well as the reach depth are optimised depending on the actual lift height. The Linde Curve Assist guarantees a safe aisle change due to speed reduction according to the steering angle.

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

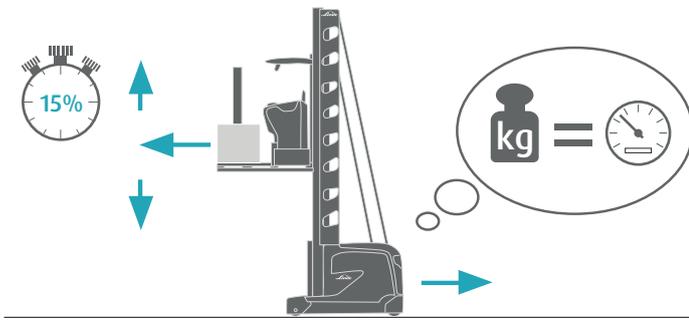
Load Recognition



LSC LOAD:

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 unloaded. Also the reach adjustment is optimised by lift height and load identification. Acceleration and speed are adjusted depending whether there is a load on the forks.

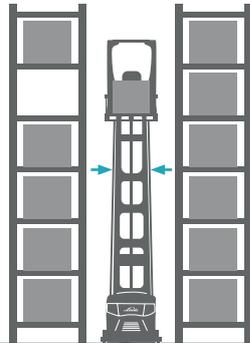
Benefit: Throughput improved by up to 5% compared to LSC Standard



LSC WEIGHT:

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. The reach adjustment is optimised by actual lift height and pallet weight. This function gives a particular benefit if pallets of different weights are being handled.

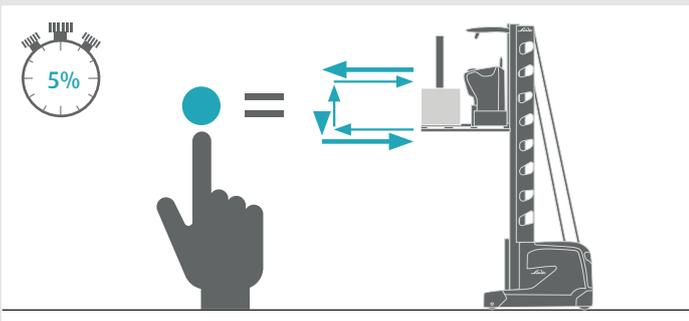
Benefit: Throughput improved by up to 15% compared to LSC Standard



LSC DYNAMIC REACH CONTROL:

Dynamic Reach Control combines all other LSC functions and expands the system by an intelligent load stabilisation. While storing or retrieving loads it adapts the reach function to the actual load weight and eliminates lateral mast oscillations. Loads can be placed faster and damages on loads and racking will be reduced.

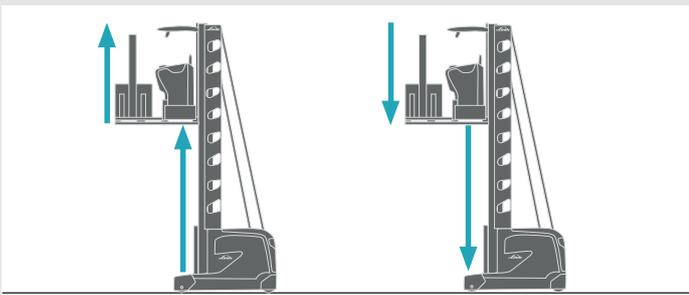
Benefit: Throughput improved by up to 20% compared to LSC Standard



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.

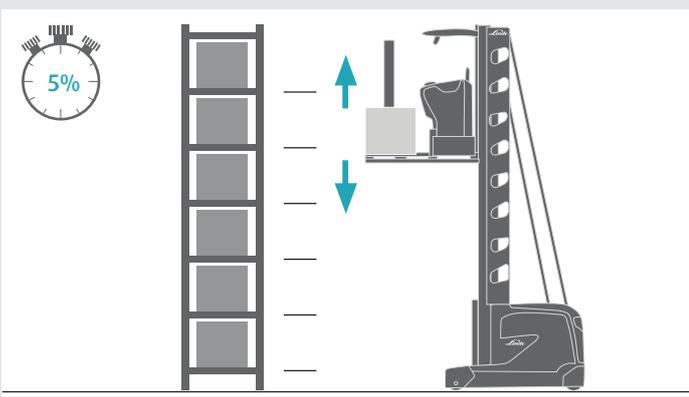
Benefit: The storage process is accelerated by about 15% and throughput is improved by up to 5%



SUPPLEMENTARY OPTION - PARALLEL LIFTING AND LOWERING:

Main and supplementary lift can be lifted or lowered at the same time simply by activating the supplementary lift button during lifting/lowering the main mast. Forks can easily be lifted in comfort position for the operator.

Benefit: Faster and more comfortable fork positioning especially at highest and lowest shelf level



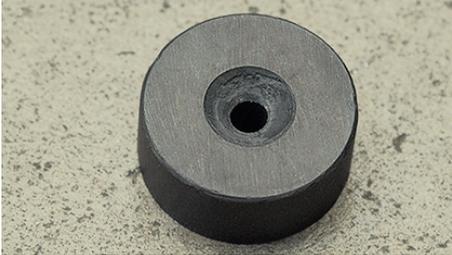
SUPPLEMENTARY OPTION – LIFT HEIGHT PRESELECTION:

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 LSC Load, Weight or Dynamic Reach Control, the truck knows if a pallet is already on the forks and thus stops +100 mm 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 magnets, RFID or barcodes can be chosen.



Magnet



RFID



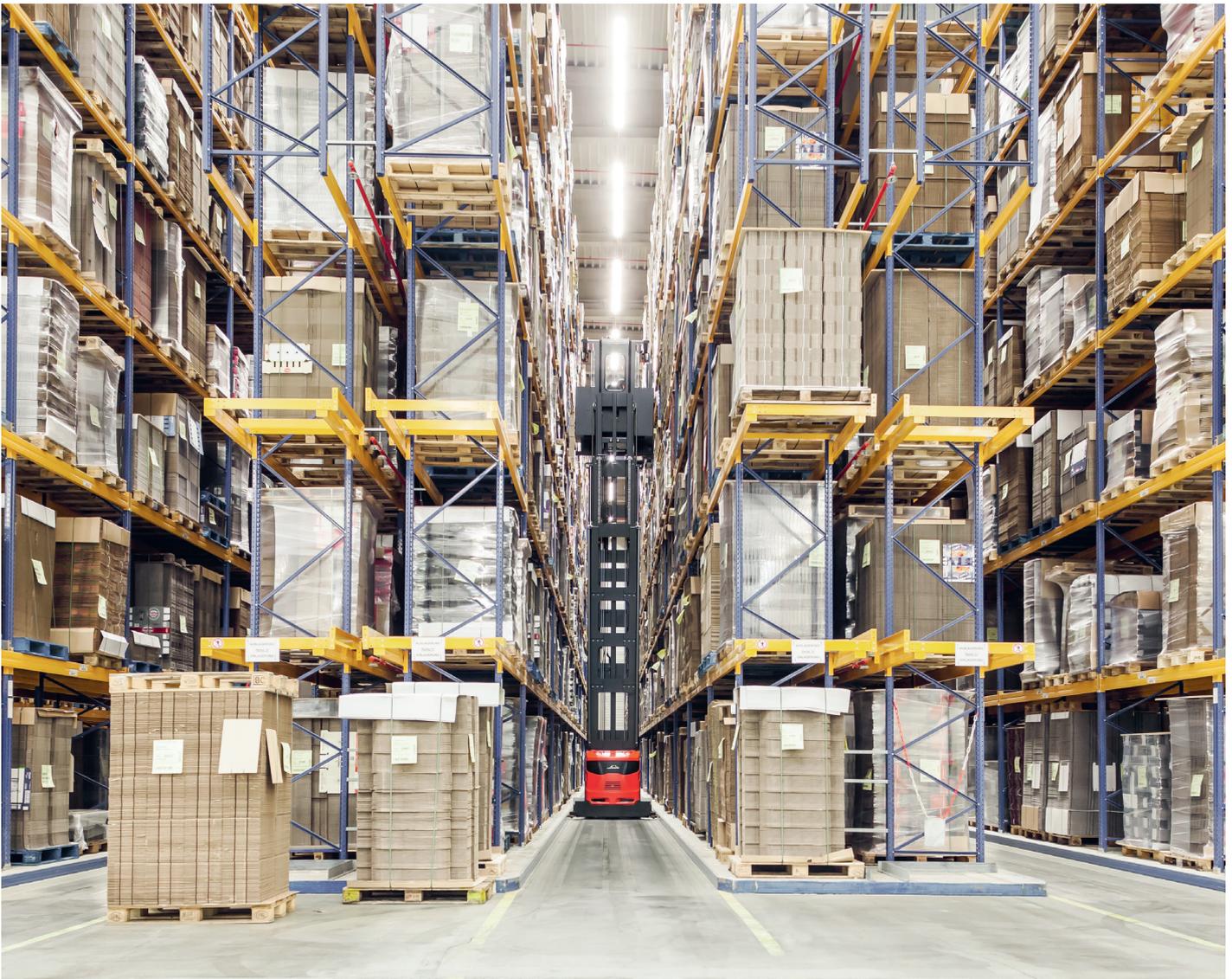
Barcode

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..



AISLE SAFETY ASSIST (ASA)

The Aisle Safety Assist (ASA) holds the individual configuration of each aisle in your warehouse and controls truck behaviour in the aisle.

Similar to a driver assistance system in the car, it supports the operator by enhancing safety, helping to avoid damage to the truck, the loads and the working environment. The system enables optimum operator performance even under tight time constraints.

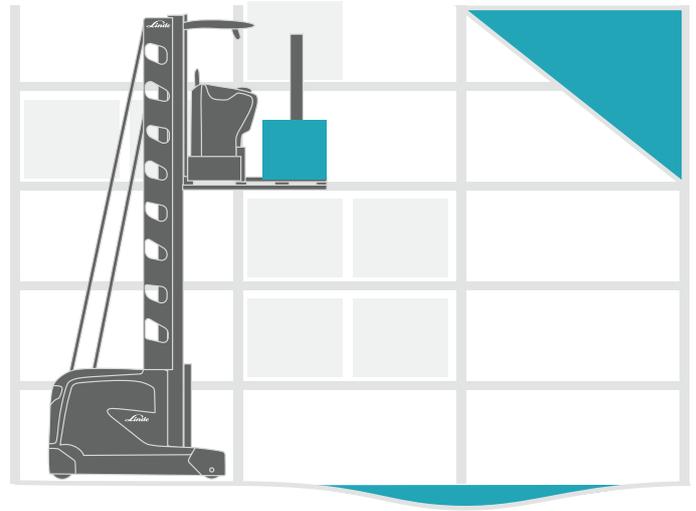
How ASA works

The truck recognises its exact horizontal position via the RFID transponders or barcodes in the aisle. It also knows the vertical position of the cabin and forks at all times due to the integrated lift height measuring system. By combining these parameters, zones are created in the warehouse giving the truck individual restrictions for each specific aisle.

For instance, traction speed can be automatically reduced in certain areas, for example while driving over expansion joints. This helps to avoid damage to wheels, dislodging of goods on the pallet and ensures a more comfortable ride for the operator.

Creating zones in the warehouse leads to the following benefits:

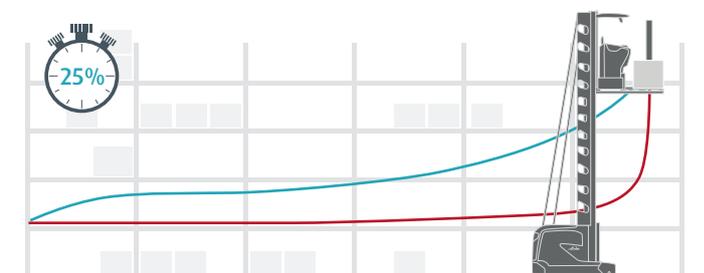
- Fixed obstacles such as steel joists or sprinklers will not be at risk of damage from the truck: automatic interlocks such as lift stops avoid any part of the truck colliding with roof joists or lights
- The operation of the truck can be adjusted to the aisle requirements helping to ensure safe and efficient operation individually tailored to every bay in the warehouse



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 blue 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 handling as well as order picking applications up to 18 m lift height.

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.

CUSTOMISATION AT ITS BEST

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.





Different cab versions

Designed to ensure more space and greater freedom of movement. Whether your operator needs a combi or comfort cabin equipped with glass doors or tilting barriers for perfect reach to picking position. Even a cabin for cold store is available. Whatever your requirements, the truck can be equipped with a cabin that meets every one of them.

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 18 m. Linde offers different mast solutions for every requirement.



Control concept

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

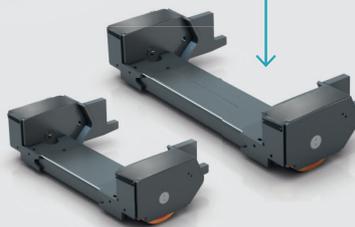
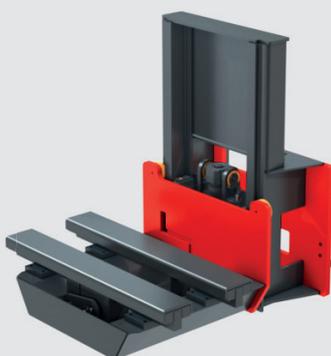
Power packages

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.

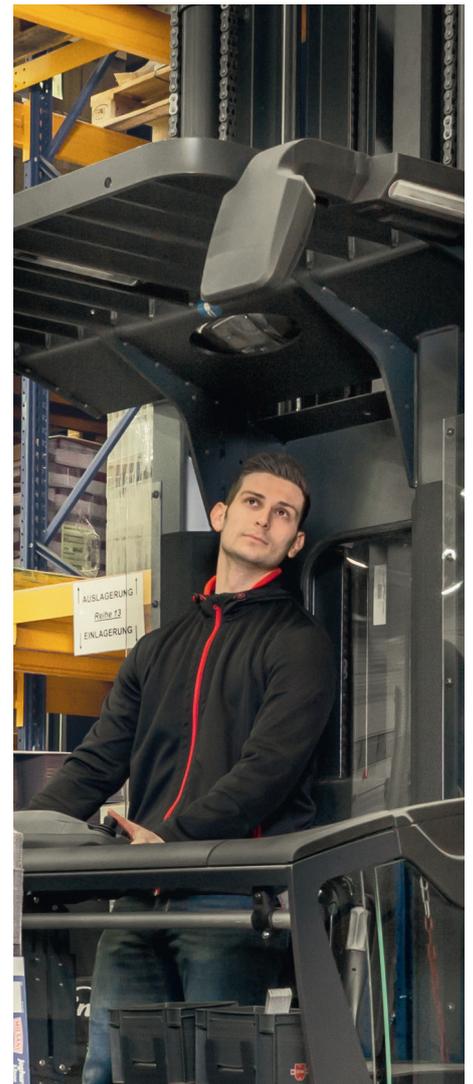
EQUIPMENT OPTIONS FOR THE MAN UP-COMBI "K" RANGE CABIN



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.

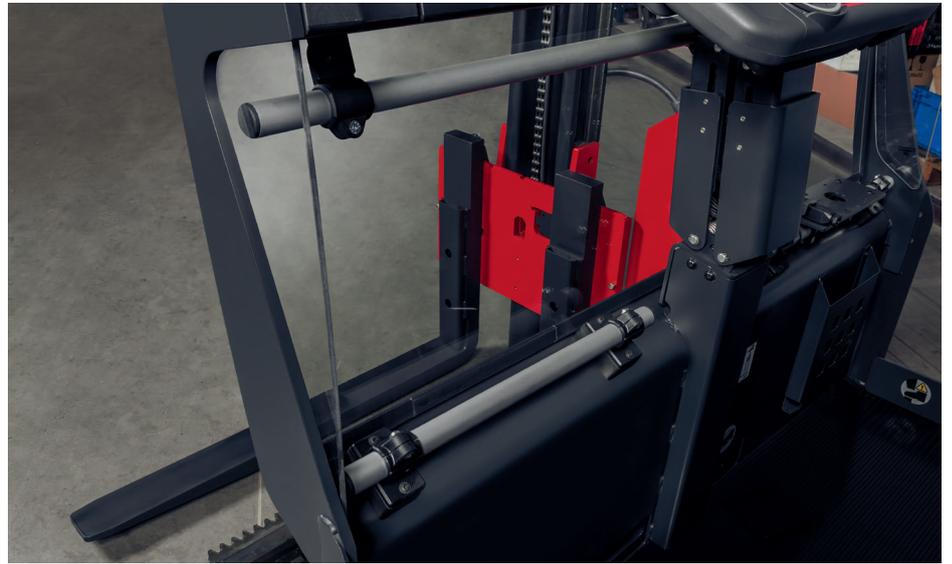


Mirror module
Best visibility onto guide rollers and over truck rear



LED

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



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..



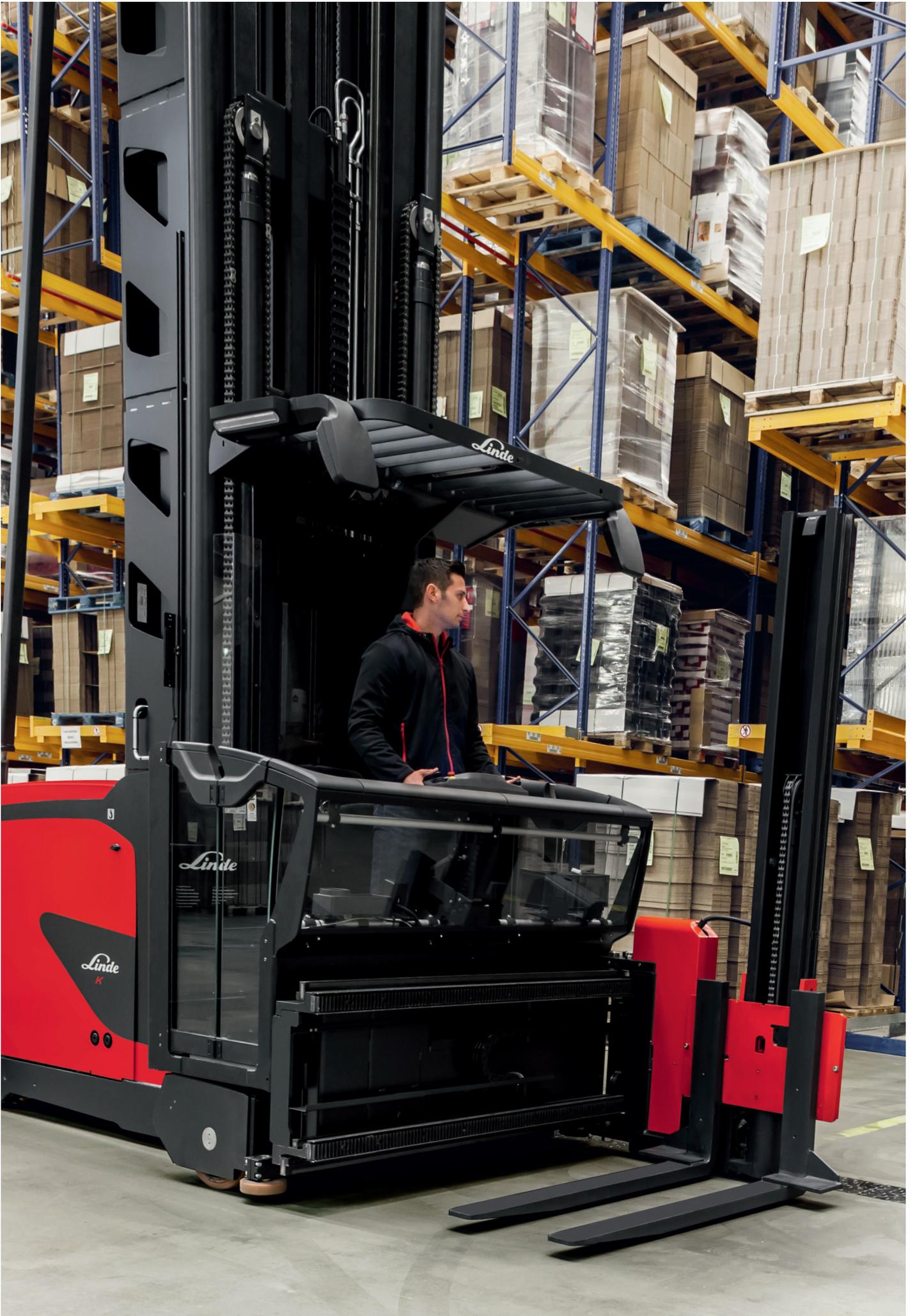
Step in

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.



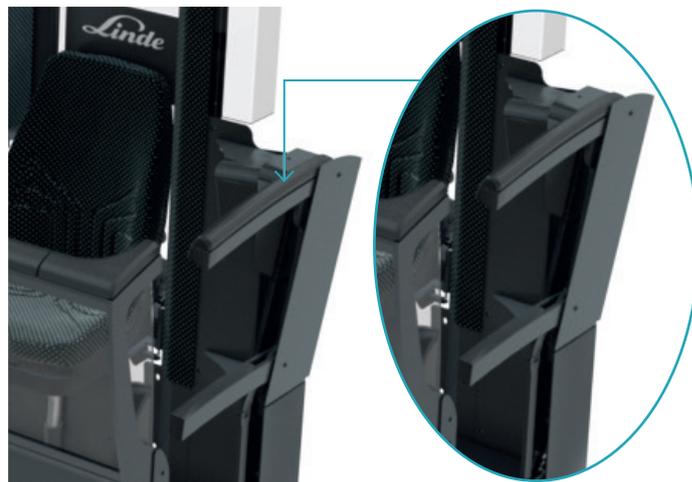
FURTHER EQUIPMENT OPTIONS FOR THE CABIN

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.



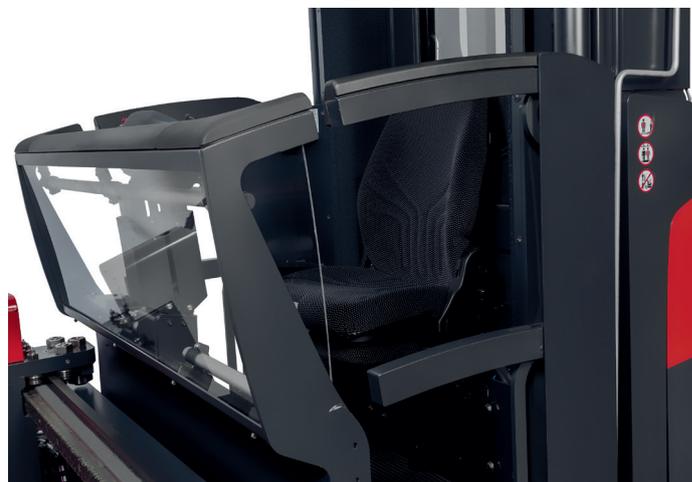
Order picking barrier

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.



Lateral barriers

Comfortable order picking with cushioned barriers.

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 in height, tilt and angle to suit each operator. The full graphic display shows all relevant truck information like time, current lift height, speed, load weight, battery level.



Seated operation for relaxed full pallet handling. The full graphic display shows all relevant truck information like time, current lift height, speed, load weight, battery level.

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.



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 panel was designed to be safe and intuitive and ensure fatigue free operating. The full graphic display shows all relevant information like time, current lift height, load weight and driving speed at any time. Integrated touch sensors ensure a safe two-handed operation. The status of options such as Personal Safety Equipment or wire guidance is displayed on the operator's control panel. 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. The innovative Rescue Alarm detects unusual operator behaviour and attracts attention in emergency cases.

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

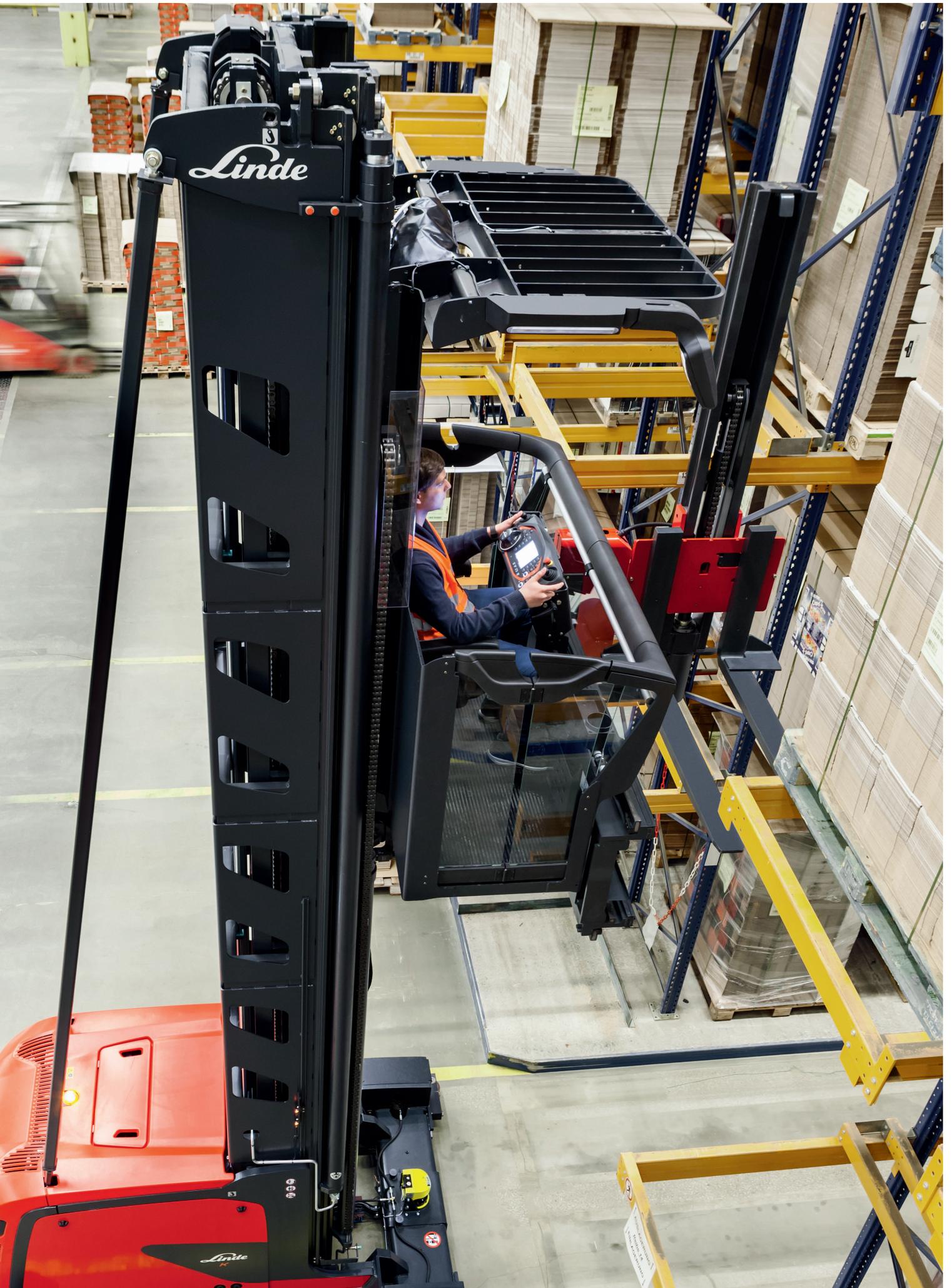
The energy recovery system ensures a long battery shift life. The lifetime of the battery is extended through intelligent energy control which manages the maximum battery current draw.

INTELLIGENCE

Innovative assisting systems support the driver and guarantee high throughput rates and safe load handling at any time.

- **Linde System Control (LSC):** Dynamic residual capacity diagram as standard. Optional LSC Load and LSC Weight to optimize all truck movements like driving speed, lifting, reach and rotate to the actual lift height and load weight
- **Dynamic Reach Control:** Effective compensation of lateral mast movements while reaching of forks and reach adjustment depending on lift height and load weight
- **Aisle Safety Assist (ASA):** individual configuration of truck behaviour like speed adjustment, lift stop and end of aisle braking in each aisle of your warehouse
- **Linde Warehouse Navigation:** Driving the shortest and fastest route to the next destination with little energy used as possible. Mistakes like storing or retrieving wrong goods at the wrong place are avoided
- **Automatic Fork Cycle:** Reach out, placing/retrieval and reaching back are done automatically as a continuous cycle controlled by single button
- **Lift Height Preselection:** The different rack heights can be easily entered into the system memory and the driver then only needs to enter the next rack destination and the forks will be raised to the required height





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.



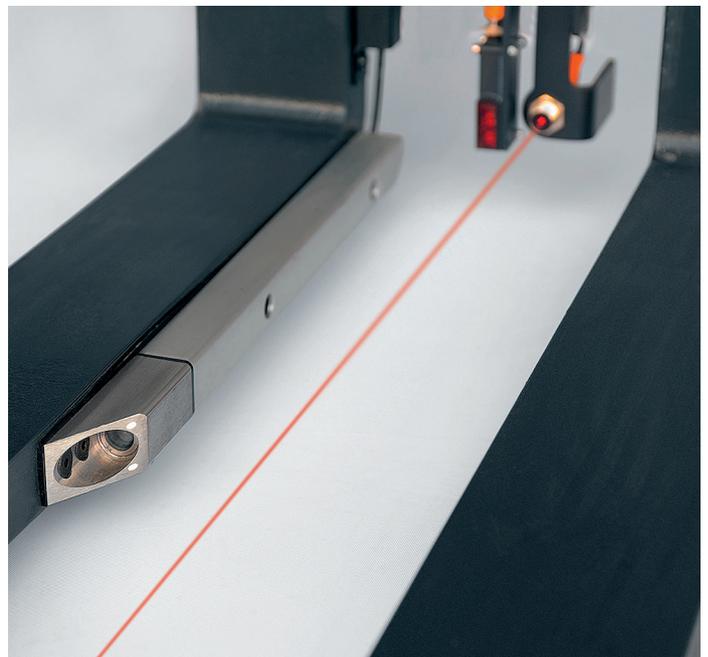
Storage
Variety of useful storage compartments.



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 full 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.

LINDE – FOR YOUR PERFORMANCE



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