

Intelligent warehousing system

Solutions for **storage** and retrieval units





Solutions for
storage and
retrieval units –
**Customized and
future-oriented**

Optimized overall solution

- Mast oscillation compensation
- Brake grind and test
- Auto tuning
- Cloud access
- Platform for future topics such as condition monitoring and predictive maintenance

As a leading specialist in automation and drive solutions, we offer you a broad product portfolio and an internationally positioned team of experts for the implementation of what are often complex needs in warehouse logistics. This allows you to benefit from long-standing industry experience and the latest know-how for the automation of intralogistics.

Working together, we will develop custom solutions for pallet and boxes storage and retrieval units (SRUs) that perfectly suit your needs:

- For all commonly encountered carriage and lifting unit concepts, e.g.:**
 - Carriages with two motors
 - Omega belt or friction wheel drives
 - Cable drums or rotating belts
- For normal operation and deep-freeze areas**
- Includes a comprehensive safety system for the protection of people and materials**
 - There is a European standard for storage and retrieval units, EN 528, a Machinery Directive that stipulates the specific safety requirements.





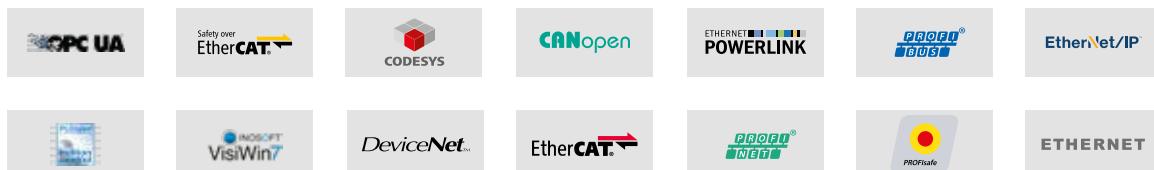
Always the right **automation** and **drive** solution

Benefit from our decades of expertise in **motion control, machines and processes**. Maximize your machine performance, productivity and energy efficiency.

Thanks to **modular machine concepts**, you can react quickly and flexibly to customer requirements and implement new business models.

Rely on **excellent hardware** and **intelligent software** in open, scalable and secure solutions.

From drive technology to the cloud, Lenze offers investment-secure solutions for every application. With our **tools and services**, we support you throughout the **entire machine life cycle** to take your productivity to the next level.





Lenze
Engineering
Suite

Sizing & selection tools
Engineering tools



Lenze FAST
Application
Software

Logic | Motion | IoT Applications



Controller
& HMI



3rd-party
Tools, Apps,
Hardware &
Services



OPC UA



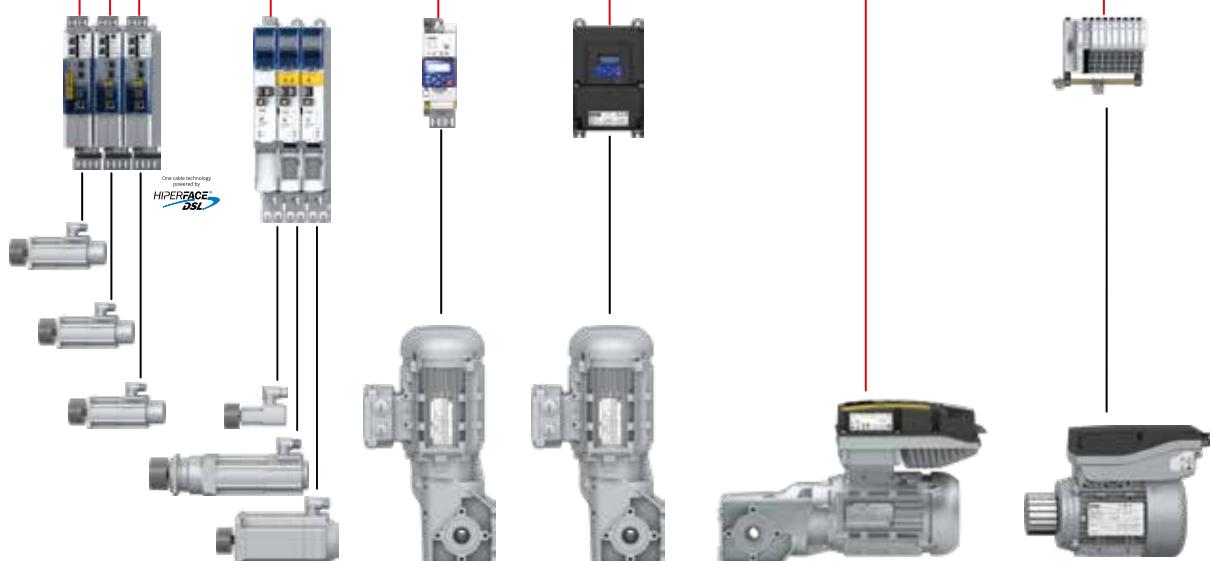
Field level
devices

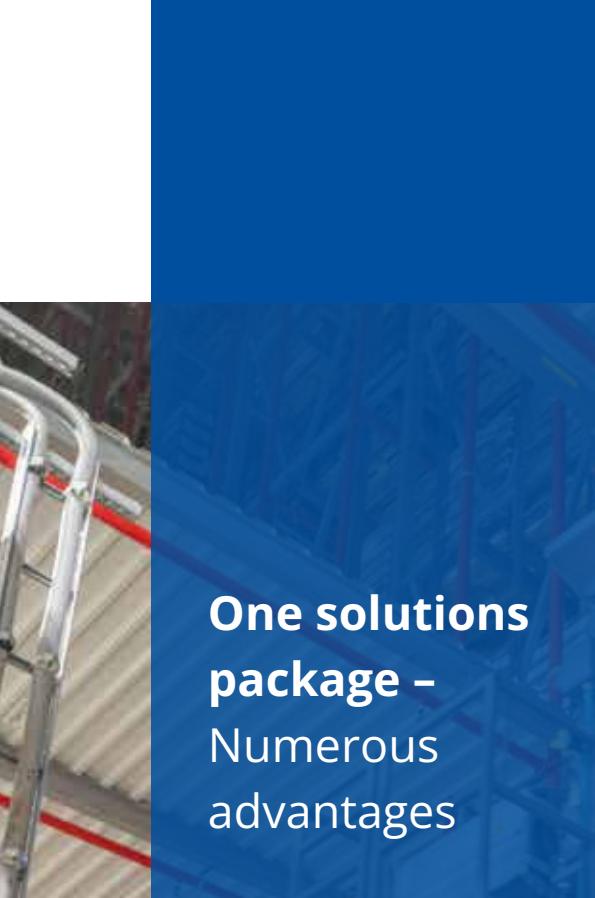


Safety &
Security
Features

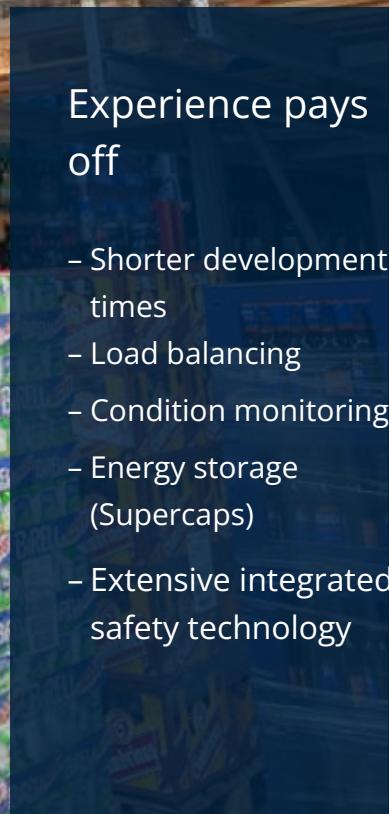
EtherCAT®

Safety over
EtherCAT®





**One solutions
package –**
Numerous
advantages



Experience pays
off

- Shorter development times
- Load balancing
- Condition monitoring
- Energy storage (Supercaps)
- Extensive integrated safety technology



Intelligent

Easy engineering by means of a centralized control architecture and a ready-made Lenze FAST machine solution:

- Shorter development times
- Optimized system performance
- Ready-made and proven solutions for the specific challenges of storage and retrieval units
- Highly standardized or individualized



Dynamic

Optimized system performance thanks to state-of-the-art control technology:

- Mast oscillation compensation
- Load balancing for systems with two traveling drives



Efficient

Intelligent energy management with two concepts that also convince system operators:

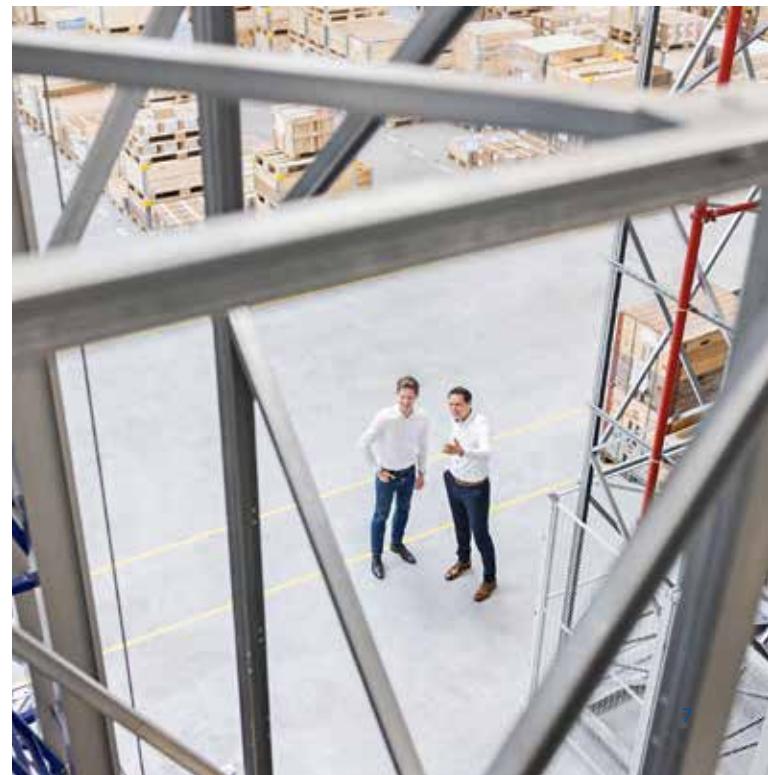
- Energy recovery
- Energy storage (Supercaps)



Safe

Integrated safety technology protects people and equipment while increasing performance:

- Extended Safety
- Profisafe
- FSoE
- Safe stop 1 (**SS1**)
- Safe stop 2 (**SS2**)
- Safe operating stop (**SOS**)
- Safely-limited speed (**SLS**)
- Safe maximum speed (**SMS**)
- Safely-limited increment (**SLI**)
- Safe direction (**SDI**)
- Operation mode switch (**OMS**)
- Safely-limited position (**SLP**)
- Safe cam (**SCA**)
- Pos.-depended safe speed (**PDSS**)
- Safe in- and outputs
- Safe Brake Control (**SBC**) Muting





Lenze FAST Machine Solution Storage and Retrieval Units

The Lenze FAST Machine Solution Storage and Retrieval Units is a ready-made PLC project for automation technology from Lenze, into which all ready-made drive concepts have already been integrated. Selection of the required components and adjustments is performed via simple parameterization.

Furthermore, the most important control commands can be executed independently of the higher-level controller and a graphical user interface simplifies commissioning. The open IEC 61131 environment also makes it possible to integrate your specific know-how or additional functions.

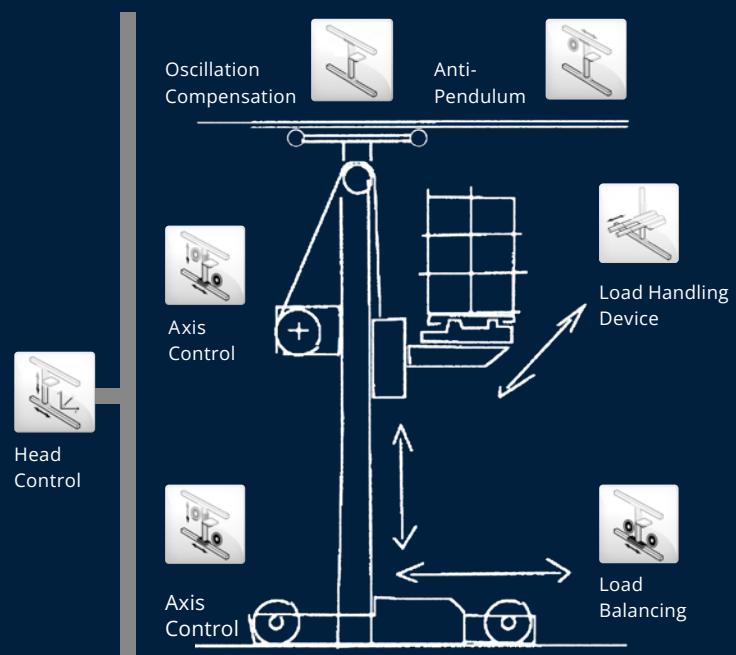
Auto tuning allows for further simplification during commissioning by automatically calibrating all drive parameters, leading to optimum, dynamic control performance. This applies to all components in the carriage and lifting unit.



Lenze FAST Technology Modules



Lenze FAST Machine Solution Storage and Retrieval Units





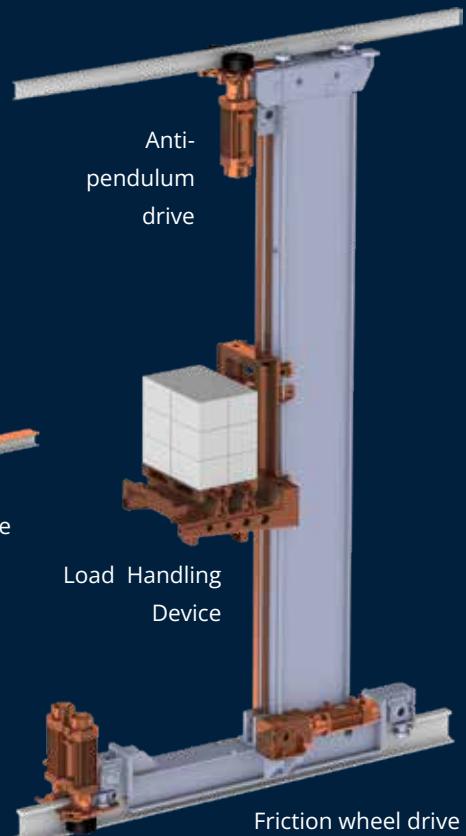
Integrated functions:

- Coordination of drive and hoist
- Manual operation/jog mode
- Auto tuning
- Referencing
- Oscillation compensation (e.g. dynamically dependent on lift height and payload)
- Simple implementation of additional axes
- Anti-sway/head drive, load levelling, Y-slave and load handling attachment
- Buffer travel
- Brake grind
- Looping in the brake
- Dynamic torque pre-control
- Maintenance mode (travel mode without external position sensor)

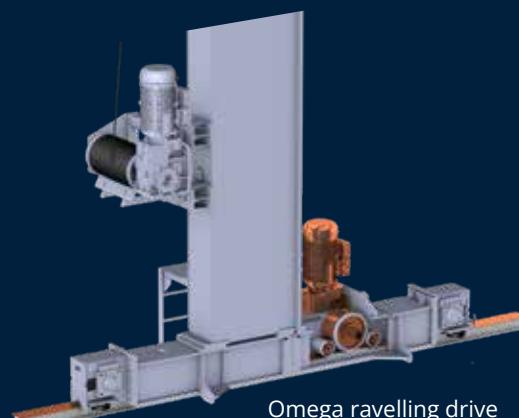
Numerous advantages for different solution spaces



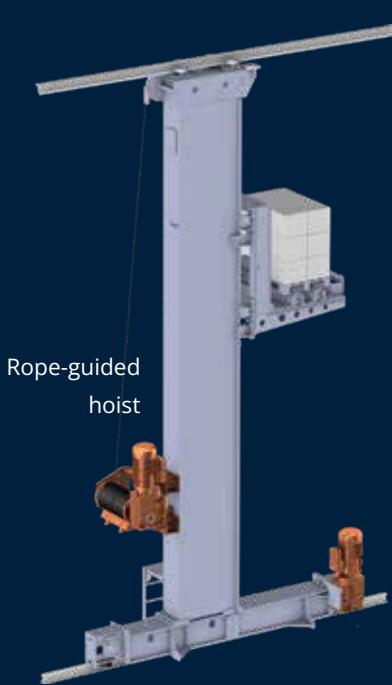
Double travelling drive



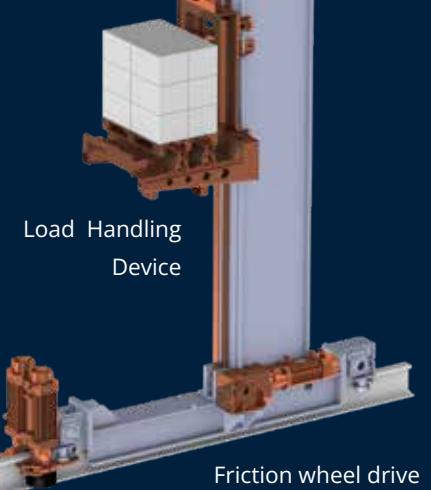
Anti-pendulum drive



Omega ravelling drive



Rope-guided hoist



Load Handling Device



Friction wheel drive

Hoist drive rotating belt



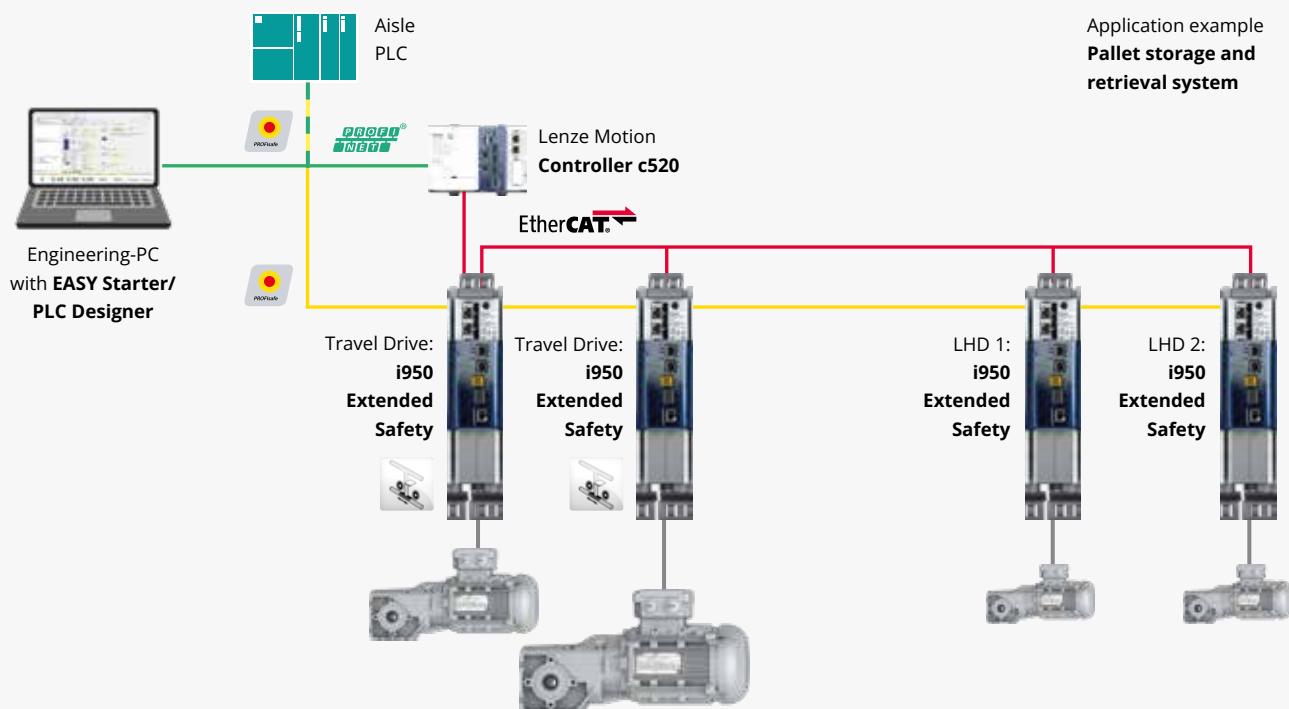
Two options of motion control

Our control technology in the drive is so powerful that we can offer two options – depending on customer needs and requirements.

Controller Based Motion

Our Controller Based Motion solution gives you maximum flexibility

- Based on the industry proven **Lenze FAST Machine Solution Storage and Retrieval Units** in more than 1,000 installations, reducing engineering time up to 70%
- Individual adaptation for customer needs with fully flexible PLC programming
- Fully integrated safety features

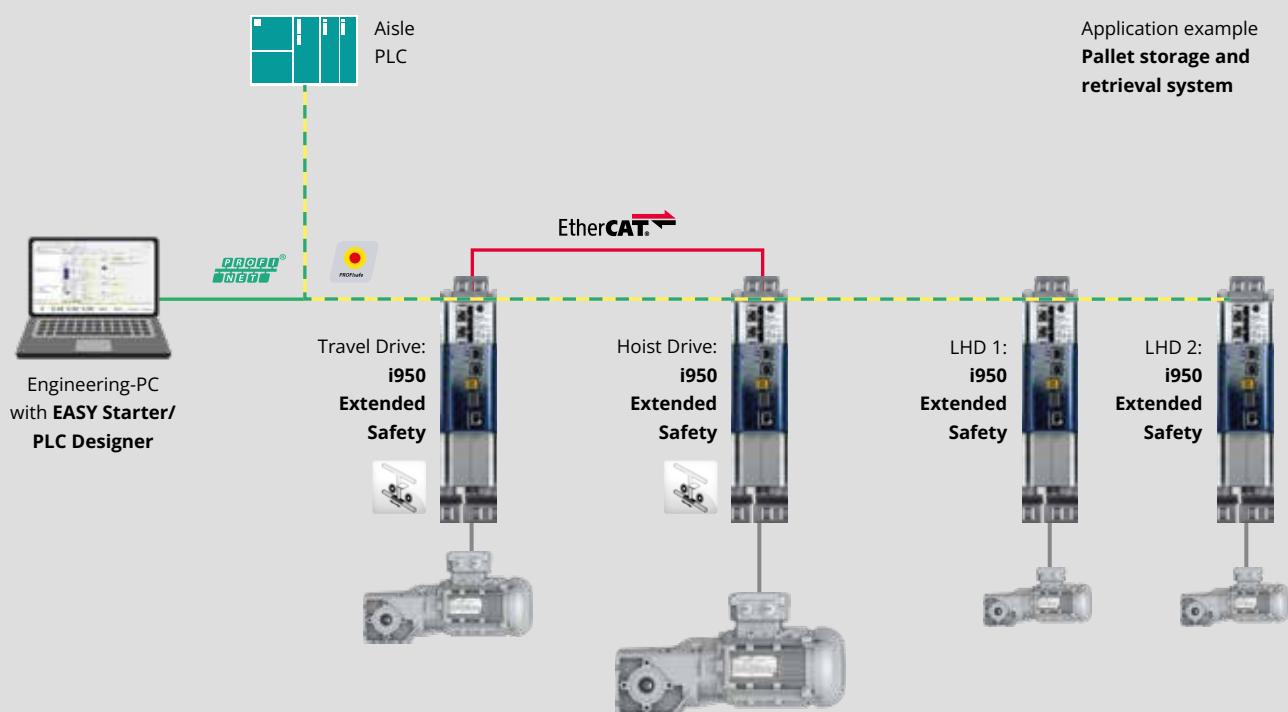




Drive Based Motion

Our Drive Based Motion solution offers maximum standardization

- Fully parametrizable Stacker Crane Application, which is not requiring PLC programming
- Fully integrated safety features
- Highly standartized solution reducing commissioning time by up to 70%



Higher throughput, standards-compliant safety concepts

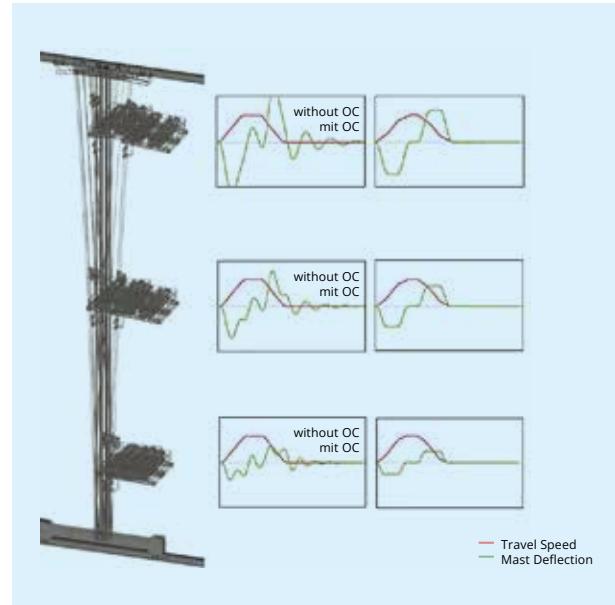
Oscillation compensation **reduces mast oscillations**

The ready-to-use **Oscillation Compensation** software module integrated into the **Lenze FAST Machine**

Solution for Storage and Retrieval Units can significantly reduce mast oscillations. This increases the cost-effectiveness of the warehouse.

- System performance increases considerably
- Cycle times are significantly shortened
- More double cycles per hour can be carried out
- The mechanical alternating load and material fatigue of the mast are significantly reduced

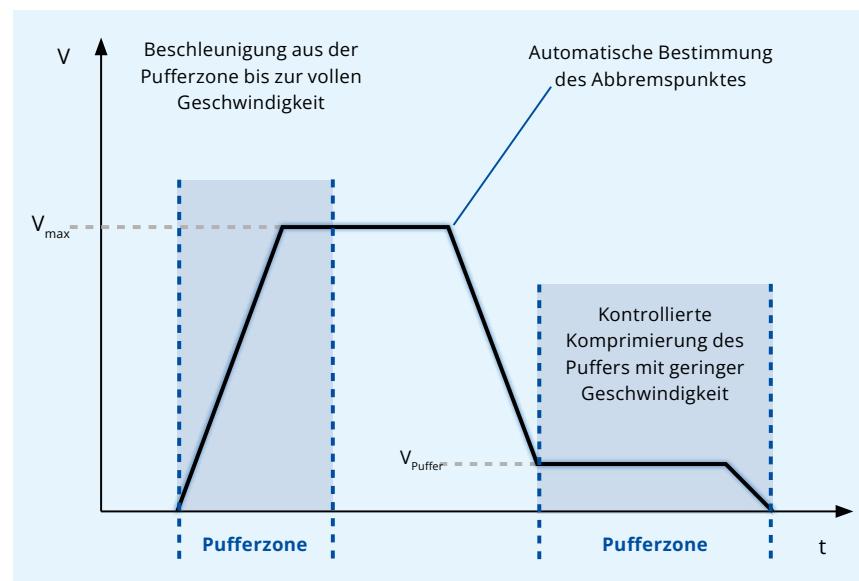
This solution can be used with hoist, traveling, and telescopic drives. The height of the load handling device and hence the variable oscillation frequency of the mast are dynamically taken into account.



Buffer travel with limited speed **increases storage capacity**

Controlled compression of the buffer allows the buffer zone to be used as a racking area.

- This allows the entire aisle length to be used, thereby increasing storage capacity
- Acceleration to full speed when decompressing the buffer saves time
- The position for deceleration to the permissible buffer compression speed is determined automatically





Load balancing **increases performance** and reduces cycle times

The challenge for pallet SRUs with two traveling drives lies in the mast stalling torque when accelerating and/or decelerating: One drive is disengaged alternately at a time, such that (among other things) the required drive force can no longer be transmitted fully to the rail (development of slip). Due to this, the pallet SRU may be unable to achieve the specified acceleration values under all load states.

Our solution to this is the **Load Balancing** software module, which is also integrated into the **Lenze FAST Machine Solution for Storage and Retrieval Units**:

- The drive of the disengaged wheel only provides just enough torque such that no wear-inducing wheel slip occurs
- The resulting torque difference is transferred to the other engaged wheel
- At standstill, no tension due to torque occurs between the drive wheels
- Manufacturing tolerances in the running wheels (which are unavoidable) are automatically compensated for

With this concept, shorter cycle times and higher performance can be achieved with the right drive sizing compared to the “two motors on one drive” concept.

Power failure control system **safeguards system availability**

Controlled shutdown of the drives in the event of a power failure by utilizing the kinetic energy without the immediate application of the brake offers significant advantages:

- Less wear to the system thanks to reduced mechanical load compared to emergency stop with mechanical brake
- Increased system availability, particularly in countries with unstable grids
- Less maintenance required for brakes and drive wheels



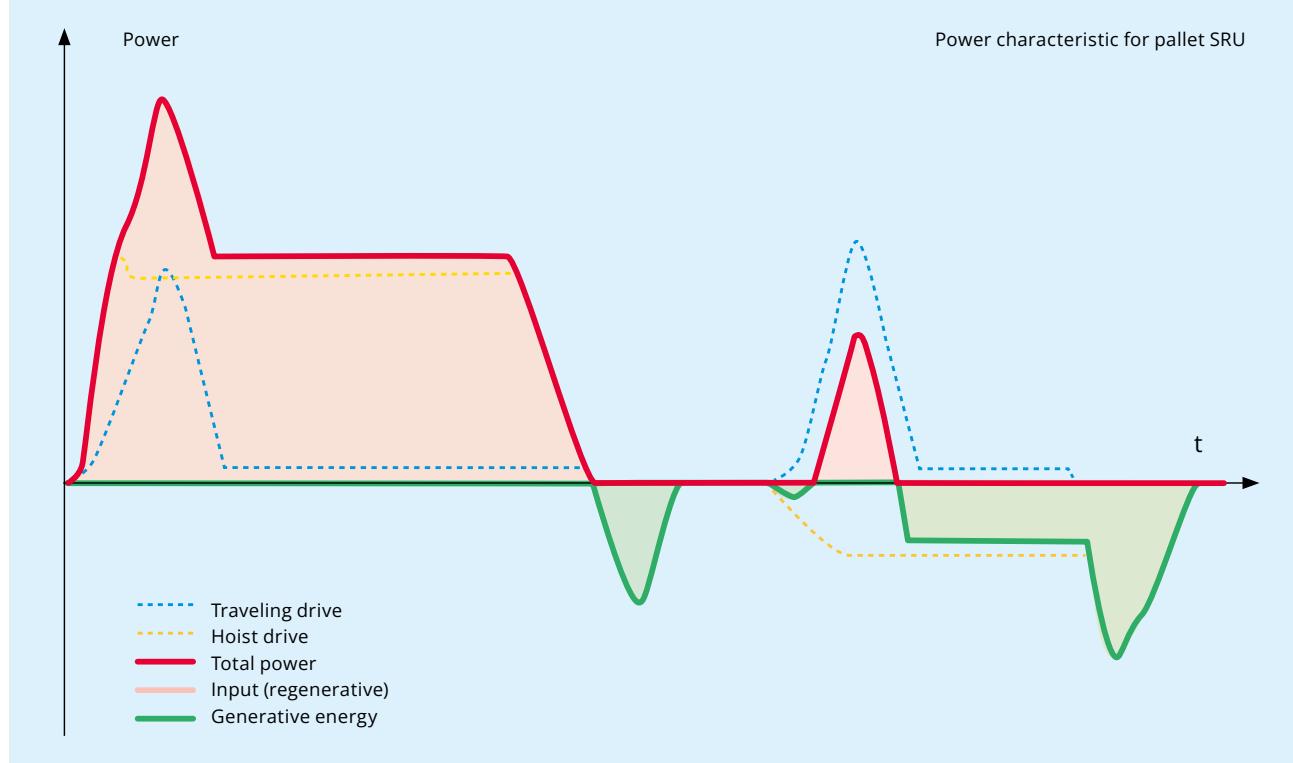
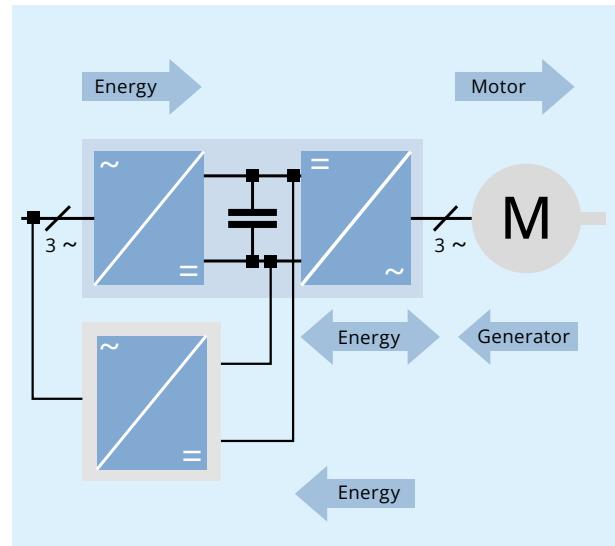


Intelligent concepts for cost efficiency

Regenerative module for the recovery of regenerative energy

Lower costs, but more options:

- Innovative technology enables significantly smaller and lighter designs with integrated filters and throttles
- Dedicated power recovery function
- Depending on the type of SRU (box or pallet), up to 25% or more energy can be saved compared to operation with brake resistance
- Extremely straightforward commissioning, no parameterization, no bus, no tools
- Connection of additional brake resistors to cover low-energy power peaks and power failure situations at the drive
- Power can easily be increased by connecting regenerative modules in parallel

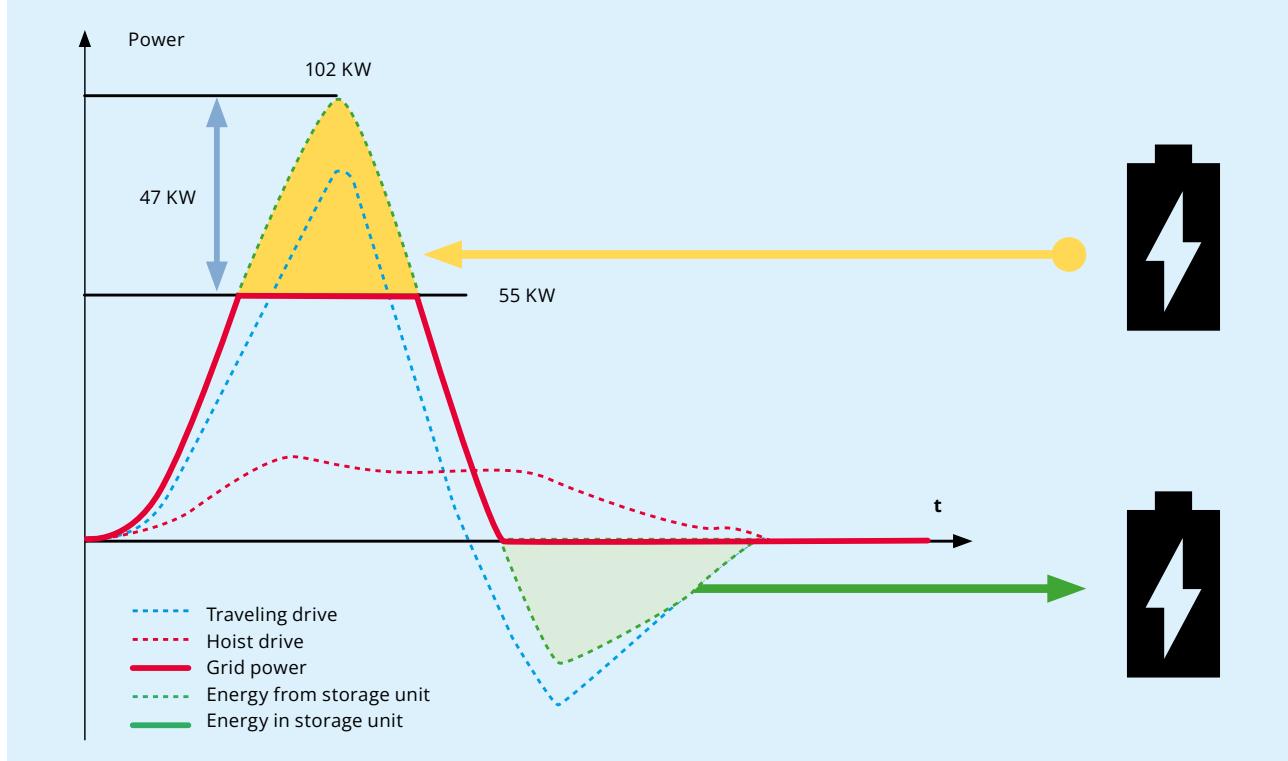




Expedient use of power peaks **with energy storage**

One goal for increasing efficiency is reducing load peaks during the simultaneous acceleration of traveling and hoist drives in the supply grid. The energy storage unit absorbs the regenerated energy during braking of the traveling drive and lowering of the hoist drive and makes it available for the subsequent acceleration and lifting process

- This allows power peaks to be reduced for greater economic efficiency
- The achievable power peak reduction and the size of the storage unit necessary for this purpose are determined individually for each SRU design and for specified traversal profiles
- Various cost savings can be made in the periphery of the supply cable, e.g.:
 - Smaller fuses
 - Smaller transformer
 - Smaller cable cross-sections





Innovative safety features reduce costs

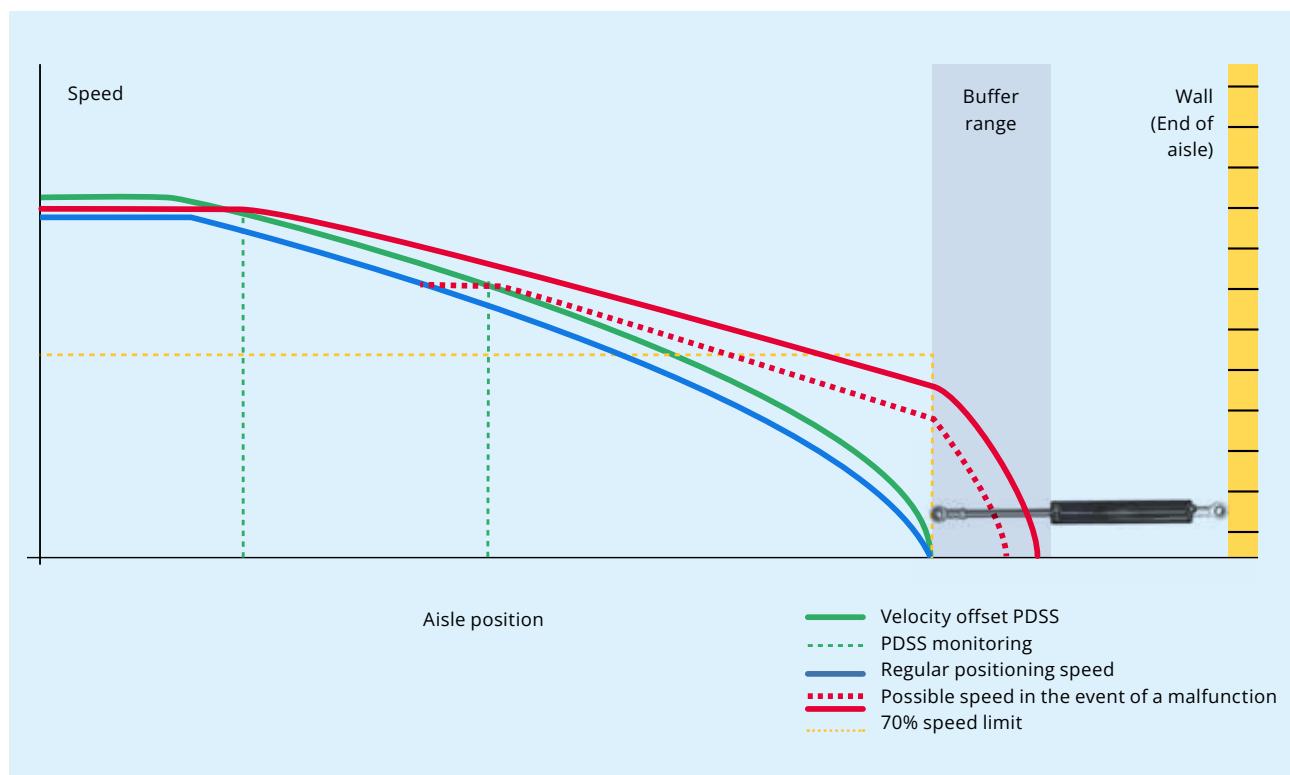
70% collision buffer

Approaching the buffer at a maximum of 70% of the maximum speed allows a 50% reduction in the buffer length. This is made possible using PDSS (Position-Dependent Safe Speed): safe, constant monitoring of the permissible speed at each position.

Excessive speed is detected as soon as it occurs and mechanical braking is triggered. A safe "70% sensor" in the aisle is not required.

Another advantage over a "conventional" solution with monitoring at only one position is the lower deceleration the mechanical brake needs to deliver. Thus, more non-critical deceleration events lead to less mechanical stress in the event of an error.

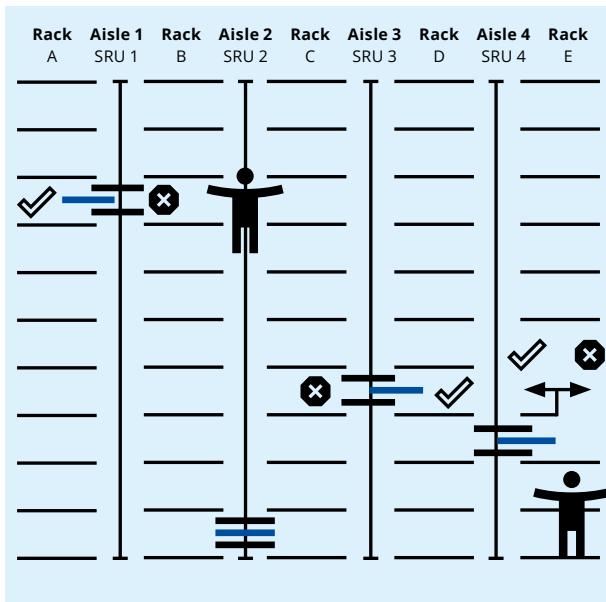
This safety technology also includes SBC (Safe Brake Control).





Safe operation of the load handling device

Safely Limited Position (SLP) is used, such as when persons are working in aisles during troubleshooting or maintenance work and adjacent lanes are not shut down. SLP prevents the telescope of the load handling device (LHD) from operating in the direction of the blocked aisle. This significantly increases system availability.

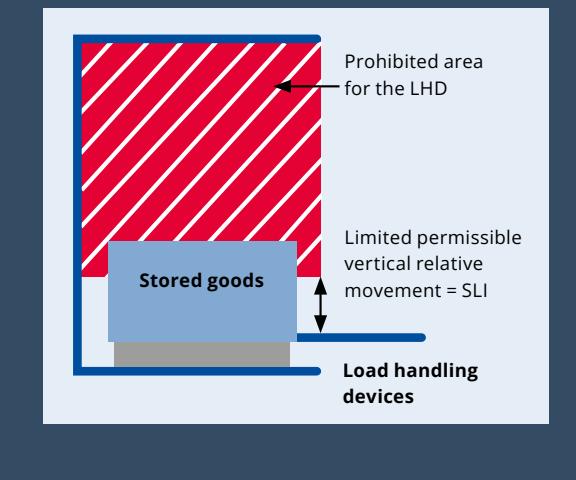


Use case 1: Maintenance is taking place in an aisle. The neighboring SRUs are to continue picking but are only permitted to reach into the other side.

Example: Aisle 2 and/or SRU 2 is being serviced. SRU 1 is only permitted to reach to the left into rack A, but not into rack B. SRU 3 is only permitted to reach to the right into rack D, but not into rack C.

Safe limitation of the lifting distance when the telescope is extended

This is also referred to as an extended safety feature – Safety Limited Increment (SLI), which protects the load, the storage and retrieval unit, and the racking.



Use case 2: There are rack areas into which the machines are not permitted to reach fully. Employees may stand behind the retrieval zone (double-depth retrieval).

Example: Aisle 4 and/or SRU 4 is permitted to reach fully into rack D on the left, but only to half the depth into rack E.

Worldwide Services

You can rely on every aspect of our high quality standards.

Our service is designed to ensure the reliability of your machine and to guarantee its availability.

With proactive solutions that rule out any contingencies, as far as possible and structured procedures, the fast and smooth restoration of the machines' functions in an emergency is ensured.

A large number of our services can be used online at any time. You can of course also get personal support and advice from our specialists.



24/7 Lenze expert helpline

Online support

You can directly request support and repairs for specific Lenze products or order spare parts and call up technical data and documentation.

Simply enter the material number or scan the type plate with our integrated scan function. All support information is immediately available to you at a glance.

Replacement requirement

Are you using Lenze equipment and need to replace a complete device or some parts? We send you a corresponding quote quickly with our online service.



Original repair

Original repairs from Lenze

In some cases, repairing a Lenze drive instead of replacing it could be a better alternative in terms of quality and cost-savings. This helps you minimize costly downtimes in cases of emergency and means that you don't have to keep large stocks of spare parts.

Maintenance with a plan

To ensure maximum machine availability, our maintenance package includes additional services that proactively safeguard your operations. We analyze your requirements together and customize your plan based on our many years of expertise in this field.

Lenze

Illustrations on page 6: System Logistics GmbH

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