

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
- Grinding of brake and brake test
- Auto tuning
- Cloud access
- Platform for future issues 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 container 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.

We have answers for all these challenges! For efficient software engineering, Lenze FAST provides you with an application framework featuring an extensive toolbox. In the **Lenze FAST Machine Solution for Storage and Retrieval Units** with ready-to-use software engineering modules, we have bundled functions to address the needs of next-generation storage and retrieval units.



It allows you to build on an existing yet flexible and easily expandable basic framework for the machine application and achieve the modularization of machine functions and standardization of interfaces. Ultimately, this reduces the time required, cost, and complexity of software engineering.

Pre-tested and documented software modules lead to better quality and optimized resource management. You can easily reuse, expand, and maintain them – efficiently, reliably, and safely. Furthermore, standards such as PLCopen ensure the open nature of our Lenze system.



**One solutions
package –
Numerous
advantages**

**Experience pays
off**

- Shorter development times
- Load balancing
- Condition monitoring
- Energy storage (Supercaps)
- PDSS (Position-Dependent Safe Speed)



Intelligent

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

- Easy project planning
- Shorter development times
- Optimized system performance
- Ready-made and proven solutions for the specific challenges of storage and retrieval units



Safe

Integrated safety technology protects people and equipment while increasing performance:

- SLS (Safely Limited Speed)
- PDSS (Position-Dependent Safe Speed)
- SDI (Safe Direction) – monitors the approach direction of the load handling device
- SBC (Safe Brake Control)



Efficient

Intelligent energy management with two concepts that also win over system operators:

- Energy recovery
- Energy storage (Supercaps)



Innovative

Solid foundation for the future of your system with reduced downtimes and servicing costs e.g., thanks to:

- Remote access
- Condition monitoring
- Transparency of overall equipment effectiveness (OEE)



Dynamic

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

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





Centralized control architecture

One motion controller for all the movement functions of your storage and retrieval unit (SRU) provides the most suitable topology.

Logic at a glance

- SRU drive control is managed entirely in the controller
- All data is stored on replaceable SD cards

Quick and easy commissioning

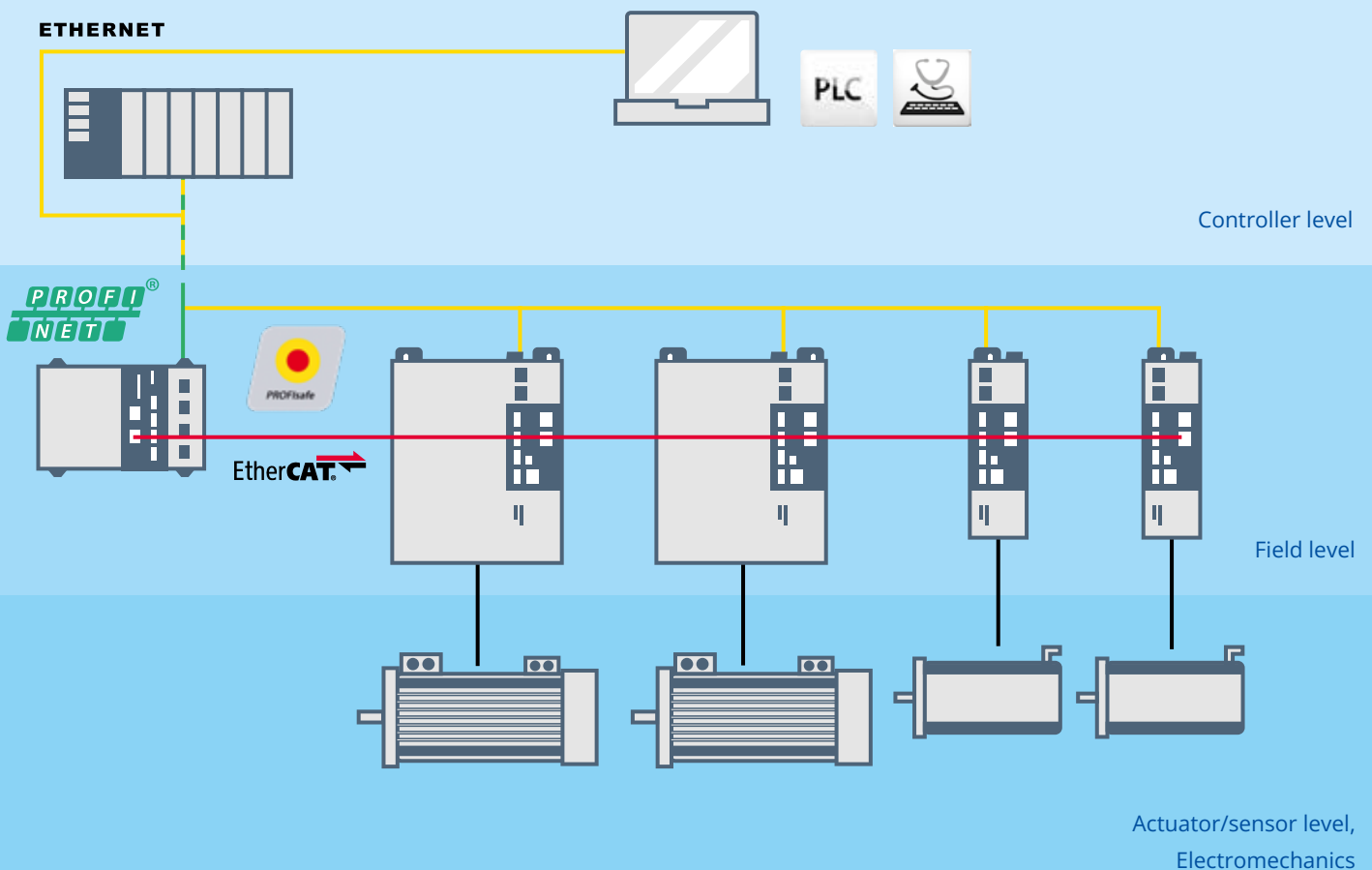
- Parameterization instead of programming
- Graphical user interface (GUI)

Concise topology

- Easy replacement of the drive controller
- No lateral data traffic between the servo inverters

Easy diagnostics

- The entire control system and safety of all drives in a single software project
- Simultaneous display of the oscilloscope signals of the entire storage and retrieval unit





Lenze FAST Machine Solution

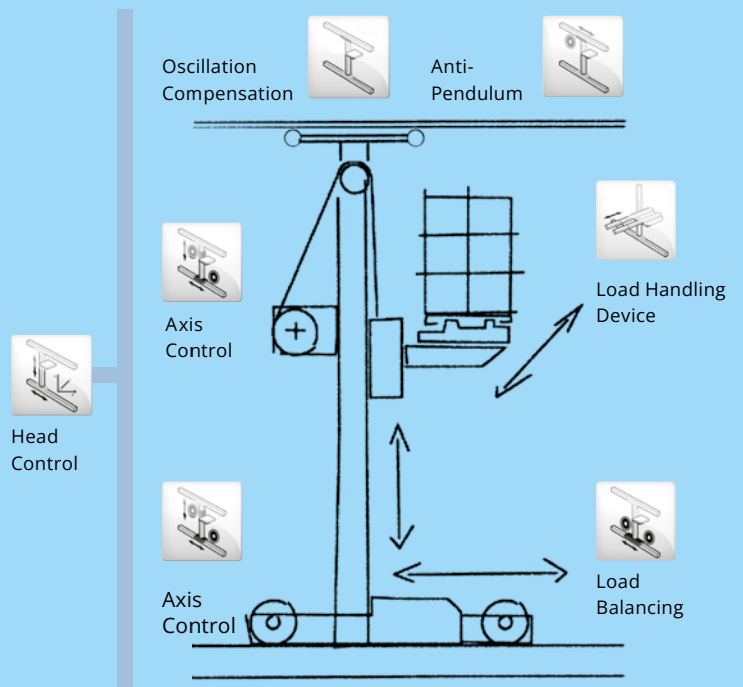
The Lenze FAST Machine Solution for Storage and Retrieval Units is a ready-made PLC project for automation technology from Lenze, into which all ready-made drive concepts have already been integrated. Selection of the required components and adjustments is performed via simple parameterization.

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.



FAST Technology Modules





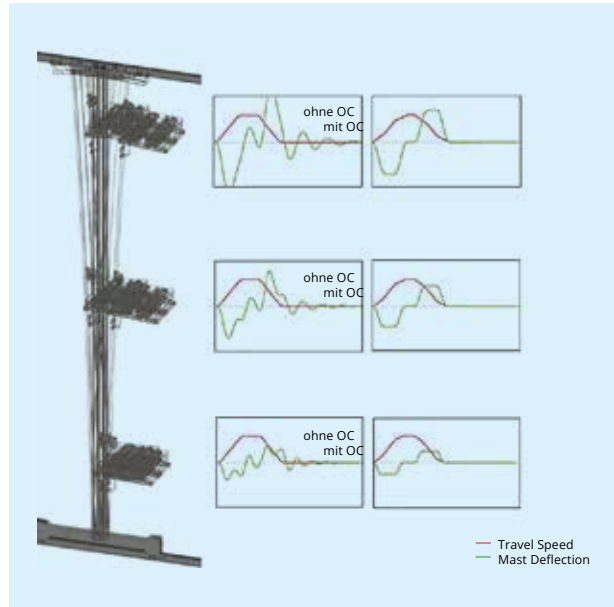
Higher throughput, standards-compliant **safety concepts**

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

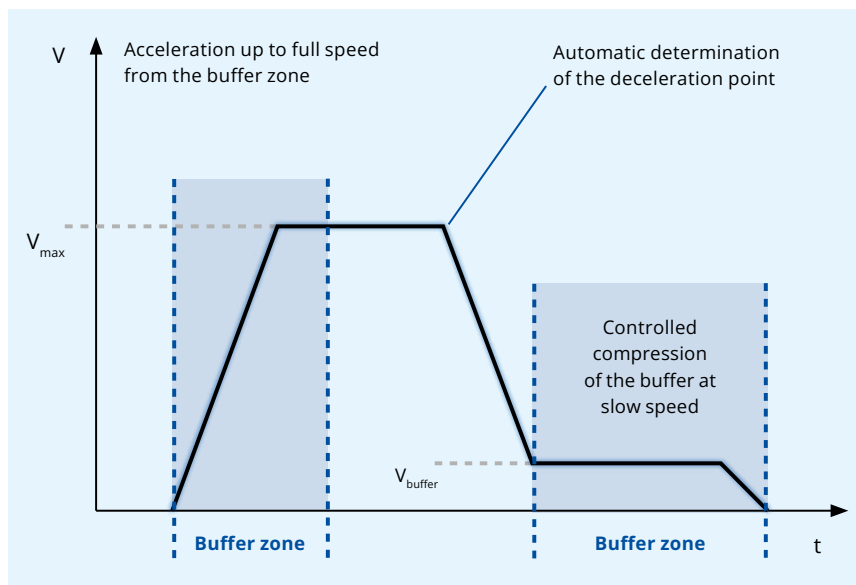
This solution can be used with hoist, traveling, and telescopic drives. The height of the load handling device and hence the variable oscillation frequency of the mast are dynamically taken into account.



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 inverter” 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



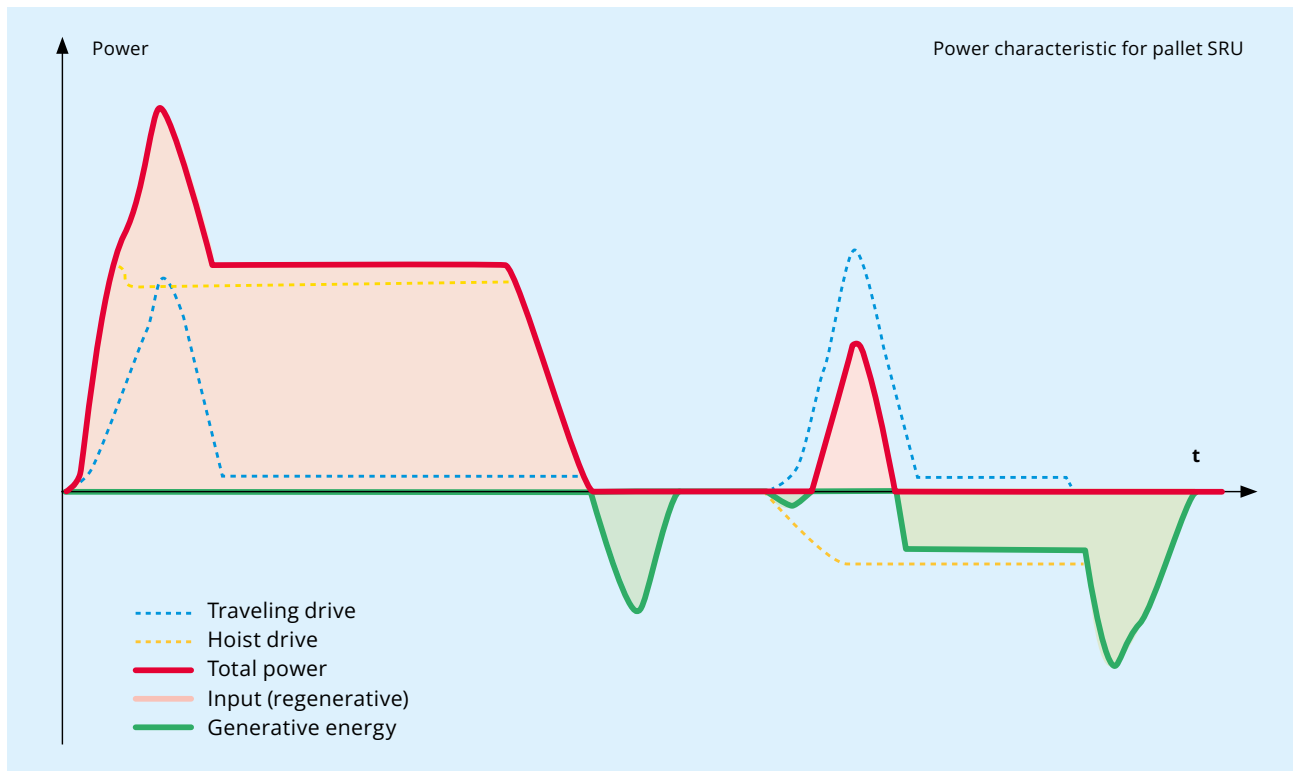
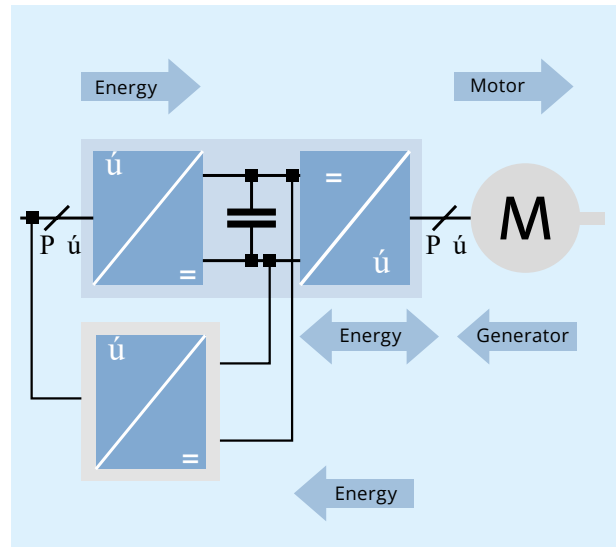


Intelligent concepts for cost efficiency

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 inverter
- Power can easily be increased by connecting regenerative modules in parallel

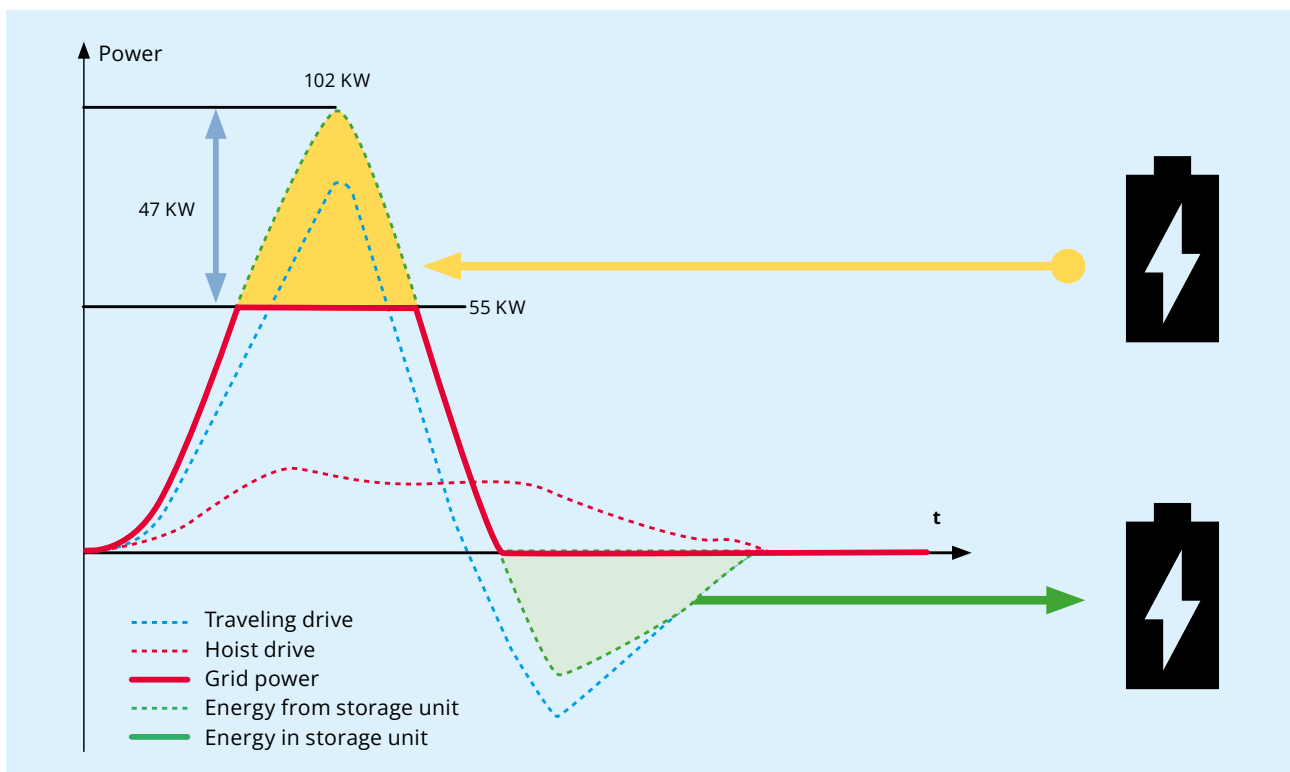




Expedient use of power peaks **with energy storage**

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





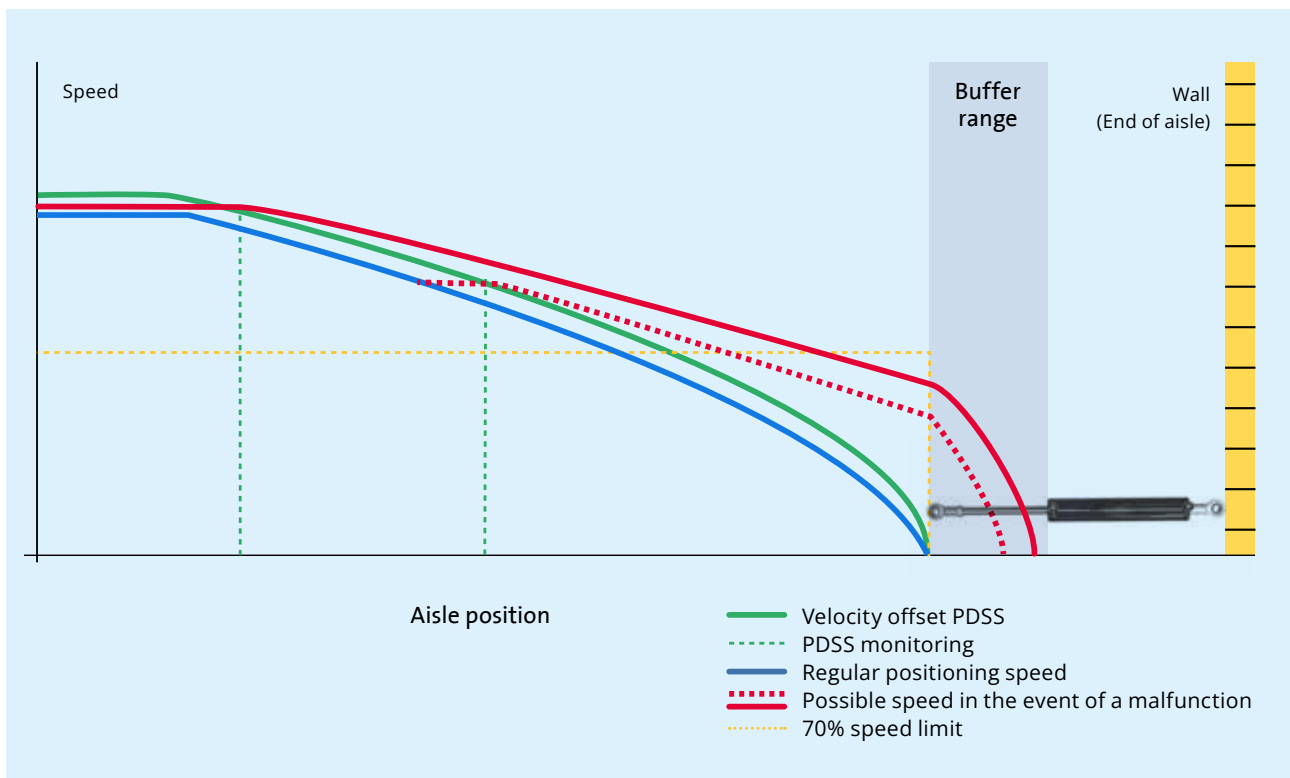
Innovative safety features reduce costs

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).



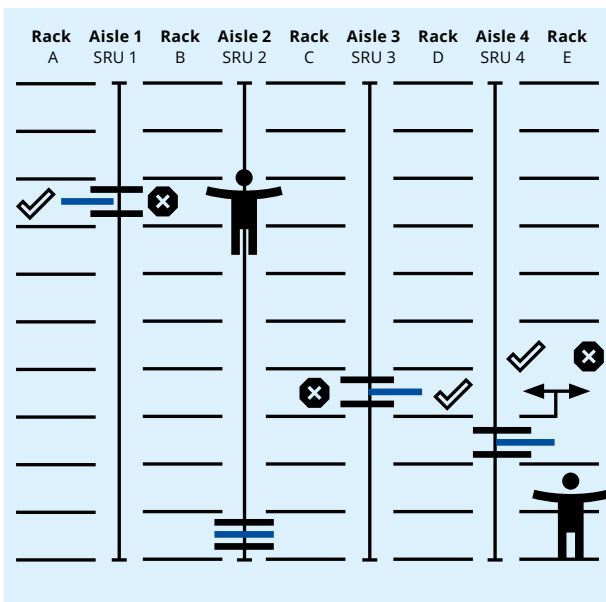
0% collision buffer

The PDSS function also makes it possible to eliminate collision buffers. This allows for better utilization of storage space and cost savings. The prerequisite for this is a safe, mechanical braking system in the storage and retrieval unit.



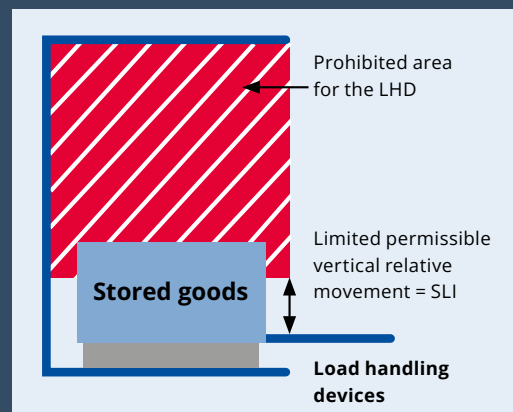
Safe operation of the load handling device

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.



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 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.

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.



Digitalization augments added value

The digital transformation is often seen as a far-reaching challenge. That is why we focus on interdependent modules. Working together with you, we create the foundation for data collection and evaluation, based on which we design future-proof technology in subsequent steps.

Remote access

Remote access to your storage and retrieval units as well as components installed in the vicinity and periphery of the overall system.

Reduced service costs

System access by centralized qualified personnel allows you to pool expertise while also reducing potentially time-consuming and cost-intensive service deployments.

Reduced downtime

System access via various access points, including mobile devices. Your service personnel can access all notifications and logbooks for the entire system directly at the system or via remote access. This allows for rapid diagnostics and troubleshooting. Furthermore, you also receive breakdowns and overviews of unplanned system downtimes – across multiple machines and systems.

Condition monitoring

Customized display interfaces (dashboards) for the needs-based visualization of component states (operating times, temperatures, current consumption).

Improved availability and value creation

Transparency for the Overall Equipment Effectiveness (OEE) of individual or networked equipment. Compare performance features at the press of a button – not just on a per-aisle basis, but also overall across distribution centers.





Cloud

Controller level

ETHERNET

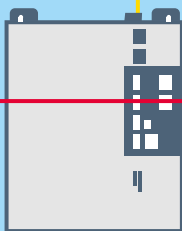
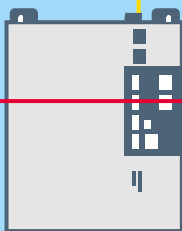


Controller level

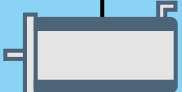
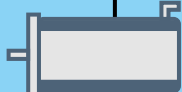
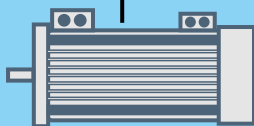
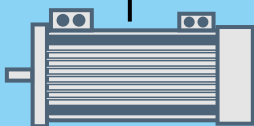
PROFINET



EtherCAT



Field level



Actuator/sensor level,
Electromechanics

Lenze

engineered to win

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