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# Efficient from the very first part

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## RLS / PHS Allround / PHS PRO pallet handling systems

Automation even for small numbers of units? We make it possible. Even varied production down to a batch size of 1 can be automated and achieved at minimal cost.

# LIEBHERR

Automation systems







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# Overview of pallet handling systems

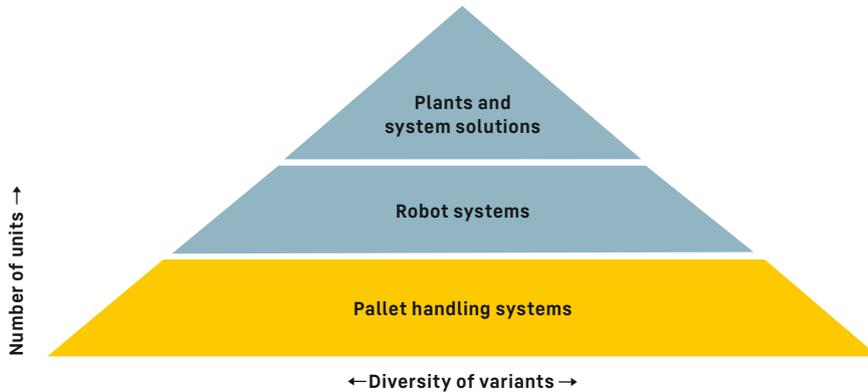
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Liebherr offers a wide range of automation systems for modern, high-efficiency manufacturing. These solutions help to reduce manufacturing costs and enable a flexible response to changes in the market: Systems can be expanded later, thereby maximizing manufacturing capacity or supplementing functions. Our focus is on ensuring that our products are cost-effective, user-friendly, high-quality, reliable and highly flexible.

As a system provider, we make use of our broad product portfolio, consisting of gantry robots, pallet handling, conveyor systems, robot cells and technological solutions.

We intelligently combine these products in flexible manufacturing cells, systems or lines for small and large projects, from batch size one to mass production.





Our product areas for diverse requirements

**Liebherr pallet handling systems make manufacturing fit for the future: A pallet handling system interlinks machining centers and in combination with the machines, forms a flexible manufacturing system which is centrally controlled by a master computer. The PHS loads machines by different manufacturers automatically with ready-equipped pallets. This reduces unit costs and increases production capacity. The cell control covers all machines and manages resources so intelligently that even small batch sizes and many different part variants can be efficiently manufactured.**

**In order to meet different needs, Liebherr offers three different systems: the compact rotary loading system RLS and the two linear systems PHS Allround and PHS PRO.**

## Economy

The common goal of Liebherr and its customers is to get the best out of manufacturing. This is possible with highly efficient machining centers. Manually loaded or partially automated machines are not sufficient for this. A pallet handling system increases the machine runtime to up to 90% by means of

- setup during the machining process: Parts are clamped onto pallets while the machining centers produce. Standstill times are minimized.
- the storage function of the pallet handling system: If the storage system is fitted with enough pallets, unmanned shifts are possible. This reduces personnel requirements and ensures fast amortization.

## Flexibility

Thanks to the modular platform systems, pallet handling systems from Liebherr are particularly flexible and versatile. The individual function modules can be freely combined with each other to find the best solution for any task.

## User-friendliness

An optimum working environment provides the basis for a smooth manufacturing process. Ergonomic workplaces at the pallet handling system and the simple, intuitive user

interface of the cell control make system control easier. In a basic version, operation can still be performed via the machine control: The operators therefore work in their familiar machine environment. This increases acceptance and enables short commissioning times and a fast production launch.

The intelligent cell control digitalizes the production processes, from dynamic planning and order management to fully automated resource provisioning. The operator is thus led through the production process and optimally supported in his work.

## Quality and reliability

Quality is the ultimate priority at Liebherr. Every production stage is consistently monitored in order to achieve the best results at all times and to ensure reliability and long product life.

The quality management system of the overall production process at Liebherr Verzahrtechnik GmbH is certified in accordance with DIN EN ISO 9001:2008 and VDA 6.4. Moreover, many years of experience and state-of-the-art technologies flow into product development.

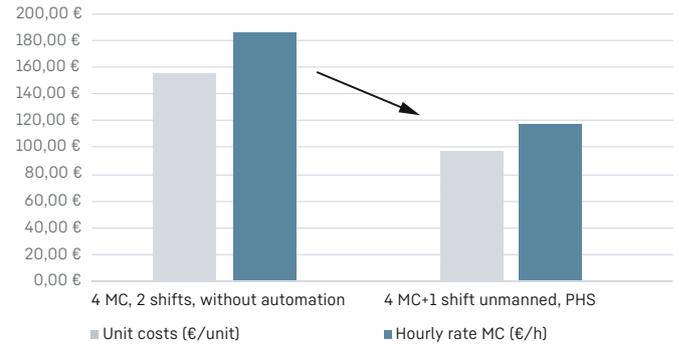
This high standard means that our automation systems guarantee high availability and part quality for the end customer.

# Economy

## Maximum machine runtime – minimum unit costs

The great advantage of a pallet handling system is the reduction of unit costs. This results from the increase in the machine runtime: Machining centers without automation achieve utilization of up to 50%. A pallet handling system increases the machines' utilization to 90%. Since you can now produce considerably more with the available machines, the unit costs fall dramatically by up to 40%.

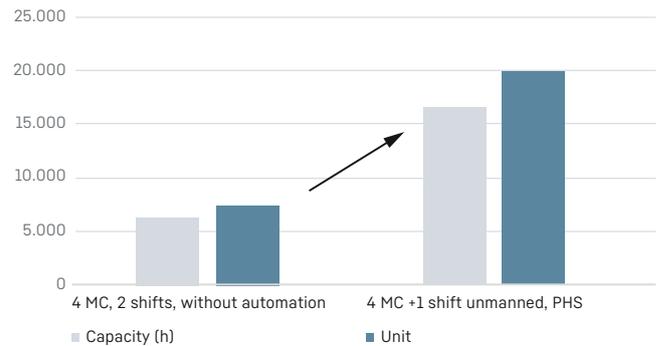
## Cost -40%



## Unmanned manufacturing for greatest possible manufacturing capacity

The PHS storage function enables parts machining even without personnel. If the PHS is fitted with ready-equipped pallets, for example, production can take place in an unmanned night shift. This in turn increases the machine runtime and the number of units that can be produced. The production capacity can be increased by up to 200%.

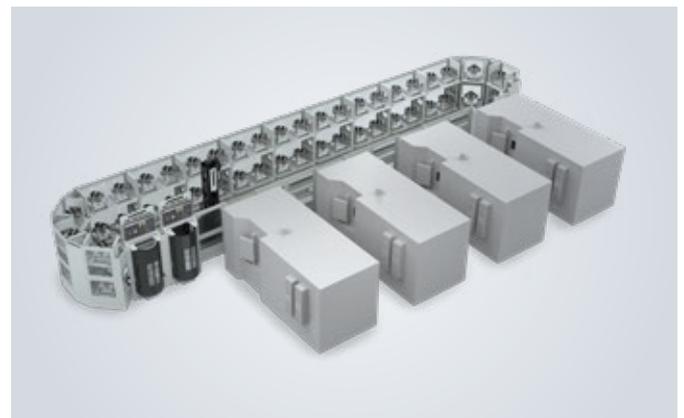
## Capacity +200%



## Productivity gains enable fast amortization

The pallet handling system means that more parts can be produced at a lower price. This results in a productivity gain for each produced part. The increased parts capacity means that the savings add up. Investment in the pallet handling system pays off in a very short time.

We will be glad to calculate the cost savings and amortization for your specific requirements – contact our Sales department.

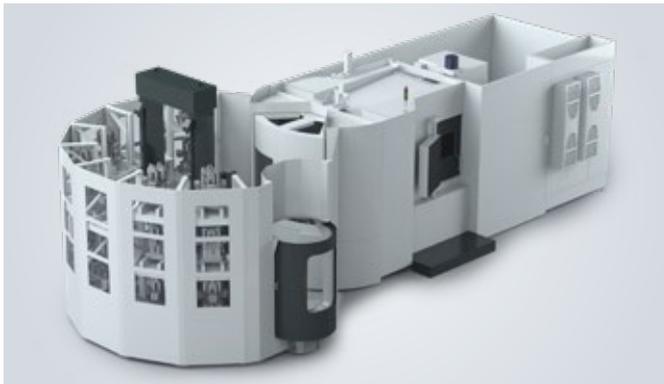


Example calculation for workpieces with a running time of 50 minutes. Linking four machines with PHS enables an additional unmanned shift.

# Flexibility

## Manufacturing systematically

All Liebherr pallet handling systems can be configured in a modular system. This gives you maximum freedom of design for your production, depending on the available space and the requirements made of the system. Our three pallet handling product lines in the area of pallet handling systems meet many different customer needs. From small to very large, we make manufacturing fit for the future: Our systems can also be expanded.



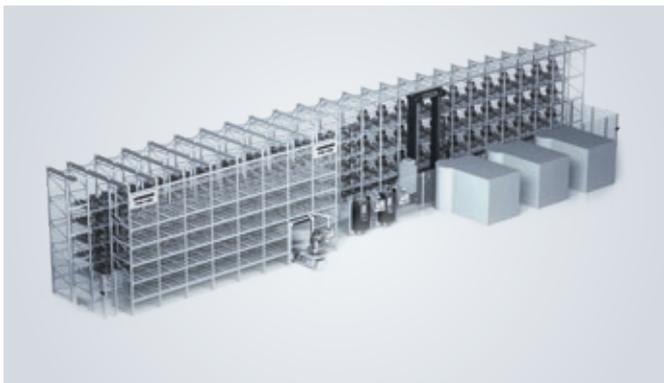
### Compact automation for individual machines

The Liebherr rotary loading system RLS automates one or two machining centers and offers storage for up to 21 workpieces. This makes unmanned manufacturing possible to a certain extent. The particular advantage: A combination of a machining center and another machine, e.g. a cleaning system, is also possible and expands the application possibilities.



### Allround talent for flexible configuration

The PHS Allround is typically used for the automation of up to four machines. Our particularly nimble lift module enables the most flexible configuration on the market. The front sides of the system can also be used, machines can be loaded at an incline, and front access is possible to decouple individual machines. The expandability in the one-meter grid completes the flexibility.



### Ready for even the greatest challenges

The PHS PRO has no upper limit and can automate up to 13 or more tons of transfer weight safely and reliably. In addition, a material supply can be integrated into this system. The shelf is designed to the customer's specifications, thus enabling the best possible use of space in terms of height, breadth and depth.

# User-friendliness

Software solutions for the control of flexible manufacturing systems make the seemingly impossible possible: production that organizes itself. As a link for all the interfaces, the cell control performs horizontal and vertical integration of the pallet handling system or rotary loading system into your manufacturing. Thus, the entire value creation chain is viewed in an integrated way and optimized.

## Keep track of everything with the control system

The control system is the link between the operator, the automation and the connected machines and devices. It can be optionally controlled by an app with intuitive touch operation or at the PC. The reduced surface reduces the training time and costs and enables operators to start working quickly. All the information is available at a glance and ensures seamless production.

## Ready for all tasks, from lean to complex

The basic system contains all the necessary functions for a quick entry into the automated production operation. In addition, further function-oriented modules are available. The user can combine and flexibly expand features – even years after commissioning, for example with the following options:

- NC program management
- Tool management
- Material management
- Fixture and Pallet management
- Detailed order planning
- Operating and machine data capturing
- CAM interface
- ERP interface



## Flexible automation – perfectly organized

Order management is the core element of cell control. It ensures on-time production and, depending on the manufacturing strategy, just-in-time as well. The possibility

of vertically integrating the ERP system enables orders to be generated directly according to delivery times. The cell control then creates the appropriate work schedules, checks resources and guides the operator through the necessary steps.



### Order management

- Organization of production orders
- Creation, blocking and releasing of orders
- Manual setting of the order sequence or dynamic planning according to target dates
- Detailed planning with production preview
- Calculation of equipment requirements
- Status display and order progress monitoring
- Implementation of manufacturing strategies, e.g. shift-dependent production or just-in-time manufacturing



### Setup dialog

- Clear presentation of all the necessary information and clamping instructions for workpiece loading and unloading
- Reporting the workpiece status as a good or reject part
- Display of measurement frequencies
- Can also be used on mobile devices



### Resource planning

- Predictive simulation with calculation of the equipment needs
- Guaranteed supply of tools, NC programs or material
- Elimination of unnecessary waiting times, increase in machine utilization



### Focus on process optimization

- Display of the machine availability status
- Presentation of machine productivity
- System use according to VDI 3423
- Parts statistics: throughput and output
- TOP 100 alarms with fault analysis
- Can also be used on mobile devices

... and many other useful functions that digitalize the production processes and optimize the entire value chain.

# Setup stations

The setup station is the interface between the operator and the manufacturing system; workpieces are clamped onto the machine pallets here. Ergonomics and ease of usability have first priority. In order to satisfy different requirements, Liebherr offers numerous setup station variants. Additional functions expand the possibilities: An electric rotary axis relieves the burden on the operator and enables accessibility on all sides of the pallet; in addition, clamping hydraulics can be integrated.

Each setup station is equipped with a decentral control system. This enables easy retrofitting and commissioning without interfering with the transport vehicle control.

## Standard

The Liebherr standard setup station has a robust design and an access door that can be operated with one hand using an intelligent safety concept. A rotary plate enables turning and locking of the pallet position at 45° intervals, which guarantees optimal accessibility. It is suitable for workpiece diameters up to 1,700 mm. An integrated container with a sump pump collects accumulated cooling lubricant and chips.

## Mobile

The Liebherr setup station with a horizontal driving axis is the alternative if integration into a storage shelf or optimal accessibility is required. It is available for all device sizes and workpiece diameters. Safety is guaranteed by an electrically driven rolling gate. An integrated container with a sump pump collects accumulated cooling lubricant and chips.

## Mobile, rotating, tipping

For special applications, Liebherr offers setup stations with mobile, tipping and/or rotation equipment. Permissible load capacities and workpiece diameters depend on the respective combination.



## Accuracy setup station

The rotary machining of workpieces on pallets, for example when inter-linking milling and turning centers or gear hobbing machines, requires a high concentricity and axial runout accuracy of the pallet. To align the workpieces reproducibly, Liebherr offers an accuracy setup station with tolerances in the micron range.



## Setup stations for material pallets

If raw and finished part management is integrated into the pallet handling system, material pallets must be loaded and unloaded from the system. For this purpose, conveyor belt systems are available in different designs and lengths. An electrically driven rolling gate provides security.



## Automated setup

Thanks to Liebherr's system competence in the area of robotics, setup can also be fully automatic. Workpieces are provided by a feed module, monitored by a vision system if necessary, and correctly oriented and placed on the clamping fixture by the robot. Automatic clamping can be carried out hydraulically or mechanically using an automatic screwing unit.





LIEBHERR

RLS 800

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# RLS rotary loading system

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Pallet handling systems are constructed either as circular or linear storage systems. Whereas linear storage systems offer a large stock of parts for extensive unmanned manufacturing times and a large number of machines, round variants impress, above all, with their compact design. This is true of our Liebherr rotary loading system RLS, which has a high storage density and a small footprint. The setup station and the machine work area are arranged next to each other, which reduces the paths of the operators and ensures a good overview. An RLS automates one to two machining centers and is therefore the ideal system solution for inexpensive entry into highly efficient manufacturing.

## Modular system

Thanks to its modular system, the RLS can be flexibly configured and can be adapted to changed requirements. The two sizes, RLS 800 and RLS 1500, cover a large application range. The RLS modular system consists of the following elements, which can be flexibly combined:

- Shelf module
- Setup station
- Lift module
- Optional: rotary storage tower

## Future-proof

If workloads change in the future, the rotary loading system is prepared. Storage locations can be expanded by integrating a rotary storage tower. If you wish to increase production capacity, a second machine can be connected. The incorporation of any desired machine contours in the RLS is a further important advantage. All components are already pre-configured for this.

## Diverse combination possibilities

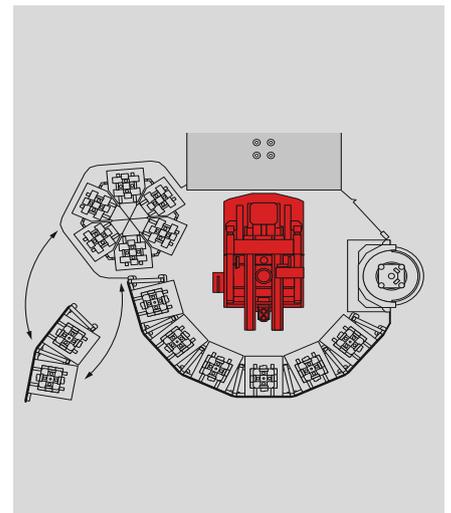
All the basic modules can be individually configured. The application area ranges from the automation of individual machines to double machine arrangements, right up to connecting two manufacturing cells.



Convenient working and short paths: The setup station for the RLS is located near to the machine control

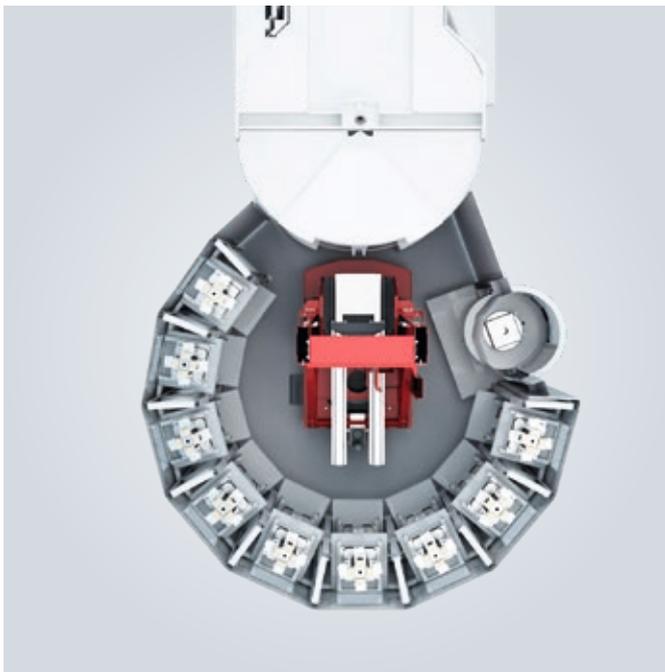


Application example: pallet with clamping fixture

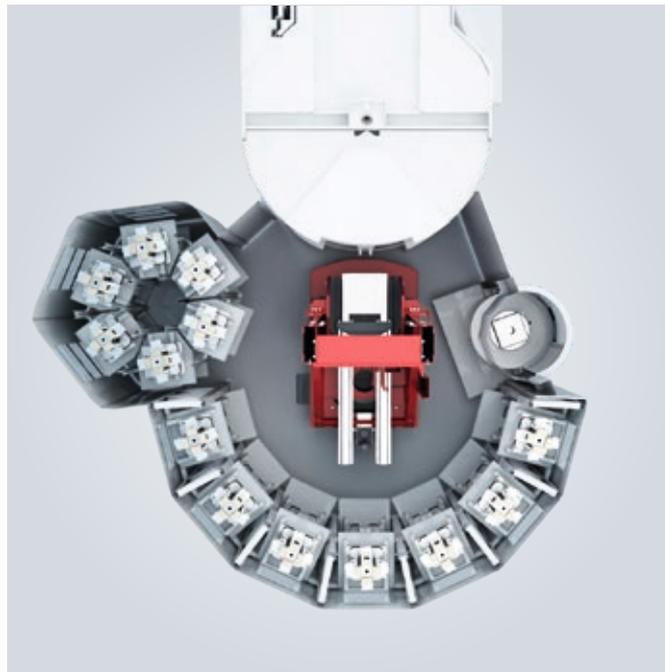


Integration of a rotary storage tower in exchange for two shelf modules

# Layout variants



Basic version



Basic version with storage tower



Double machine arrangement with one storage tower



Double machine arrangement with two storage towers

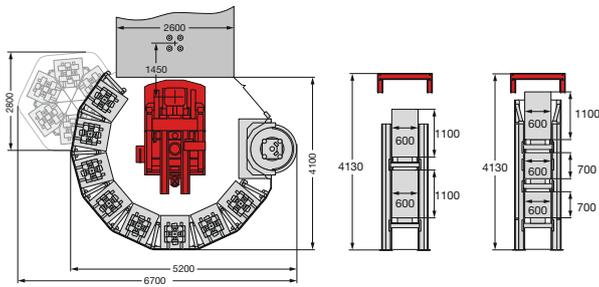
# Technical data

## Technical data

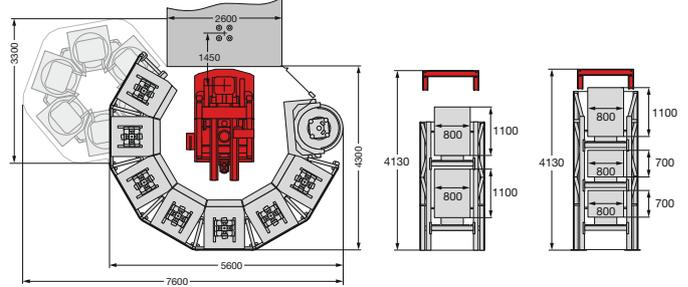
		RLS 800		RLS 1500	
Transport load (kg)		800		1,500	
Height of workpieces incl. pallet	2 levels	2 x 1,100		2 x 1,400	
	3 levels	2 x 700 + 1 x 1,100		2 x 600 + 1 x 1,300	
Collision circle diameter (mm)		600	800	900	1,300
	Number of storage locations	2 levels	16	14	14
Maximum height in (mm)	3 levels	24	21	21	15
	2 levels with RST*	24	22	22	16
	3 levels with RST*	36	33	33	24
		4,130		4,130	

\*Rotary storage tower

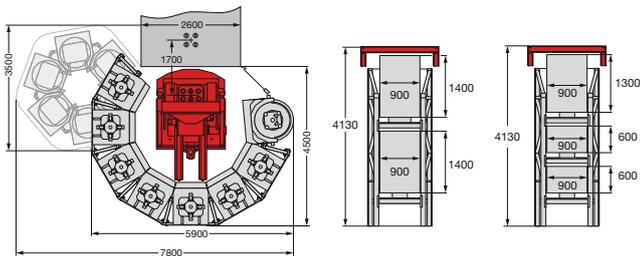
RLS 800: Ø 600 mm



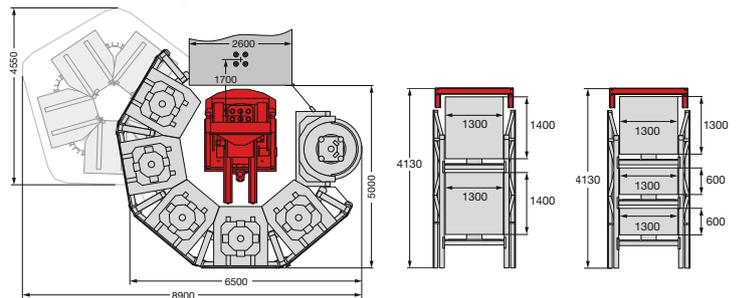
RLS 800: Ø 800 mm



RLS 1500: Ø 900 mm



RLS 1500: Ø 1,300 mm



Video: Rotary loading system RLS  
<https://go.liebherr.com/y4WWm6>



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13 10 1 220 kg  
Ø 900 mm Ø 1,40 m

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# PHS Allround

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The Liebherr pallet handling system PHS Allround allows a large group of users to enter the world of flexible manufacturing. Flexible configuration with standardized modules was a priority during product development. This enables the fast, uncomplicated arrangement of a system from standard assemblies, which is nonetheless adapted to individual customer needs. Such a flexible manufacturing system can be expanded in steps: We take our customers' future plans into consideration – even in our first quotation.

The particular feature of the PHS Allround is the possibility of also using the front sides of the linear system: Machines, setup stations or other units can be attached on every side of the equipment. The system thus adapts perfectly to the spatial conditions at the installation location. Innovative options such as the double loader and front access also set new standards in this product segment.

Due to the compact design with optimum space utilization and low overall height, this system is particularly suitable for use in existing halls with low ceiling heights. This makes the pallet handling device a true all-rounder.

## Economy

The PHS Allround typically interlinks up to four machines and increases productivity – just like all Liebherr pallet handling systems. A special feature of the PHS Allround are the comprehensive loading possibilities: A special motion sequence combines a turning and swivel movement and can also load machines standing on an incline. The lean pick-up fork will fit into even the narrowest work areas, which means that machining centers can be loaded directly. This means that purchasing a pallet changing system is no longer necessary, which further accelerates amortization.

## Flexibility

Thanks to the modular platform system, the PHS Allround can be configured as needed and expanded at any time. If workloads change in the future, the PHS Allround is prepared. The addition of rotary storage towers in exchange for existing shelf modules offers the possibility of significantly increasing the storage capacity in limited space. The entire system can be flexibly expanded in a 1-meter grid. Thus, additional machines and setup stations can be integrated into the system at any time.

## Modular system

The modular system is highly flexible, individually configurable and expandable. Great versatility, manageable costs and short delivery times are the result. The PHS Allround modular system consists of the following elements:

- Shelf module
- Setup station
- Lift module as a single or double loader
- Machine-specific fork (pallet holder)
- Optional: rotary storage tower
- Optional: front access

# Options



## Front access – for minimum standstill times

The optional front access enables you to access individual machine tools at any time by decoupling them from Automatic Mode. The special feature is that neither the pallet handling system nor the remaining machines are affected by this and can continue production without restriction. This guarantees continuous production even during malfunctions or service and maintenance work on individual machines.



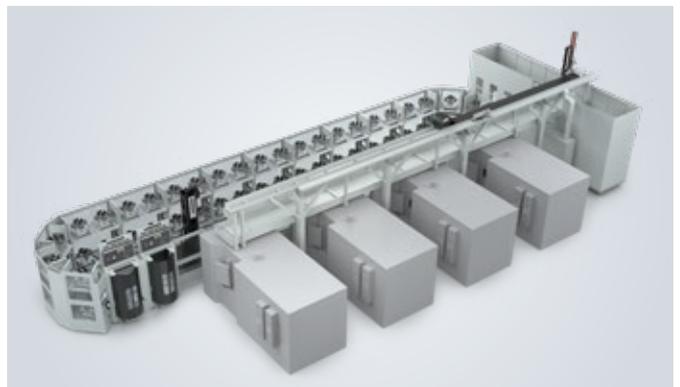
## Double loader – for workpiece change in one motion

The lift module with double loader enables even higher efficiency of the machining centers. In one motion sequence, a completely machined workpiece pallet is removed and new parts are fed into the machine. Particularly for short cycle times, this increases efficiency by a further five percentage points. This makes a pallet changing system superfluous. A further application of the double loader is the combination of two different pallet sizes in one system, which makes the PHS even more adaptable.



## Maximum lift – for challenging machines

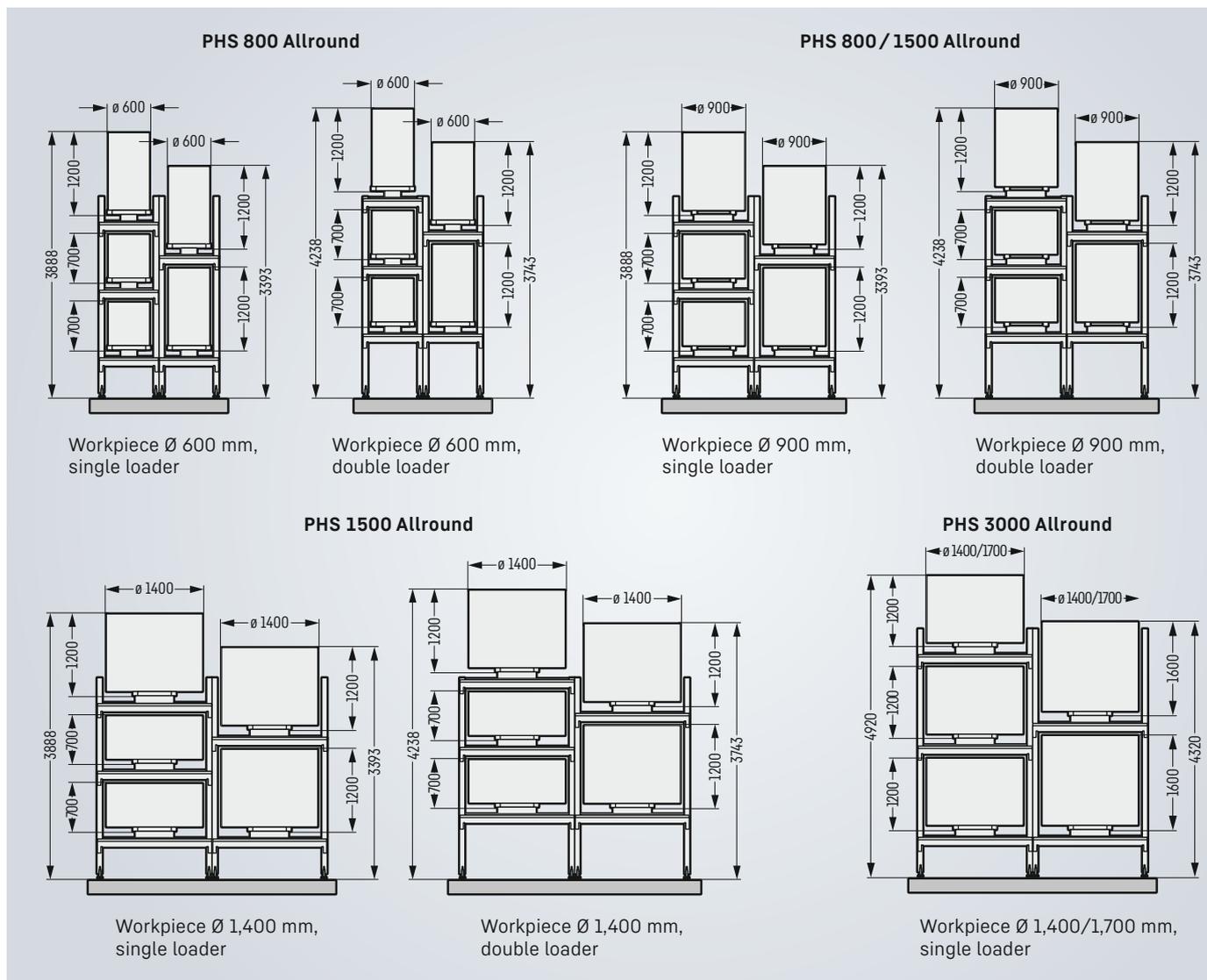
Machines which are a challenge to load can also be automated by the PHS Allround. Machine tools with a swivel rotary table, for example, have a work table which is very far in. Thanks to intelligent technical concepts, the PHS Allround's telescopic lift can also reach such extreme applications. The front access therefore always remains feasible.



## Tool handling – for even more comprehensive automation

With a tool handling system (THS), tool management is also automated. Tools are managed in a central storage location and automatically distributed to the machines. In this way, we contribute to the further improvement of your resource management and increase the productivity of the machine tools.

# Technical data



On the highest shelf, higher workpieces are possible if the hall height allows it.

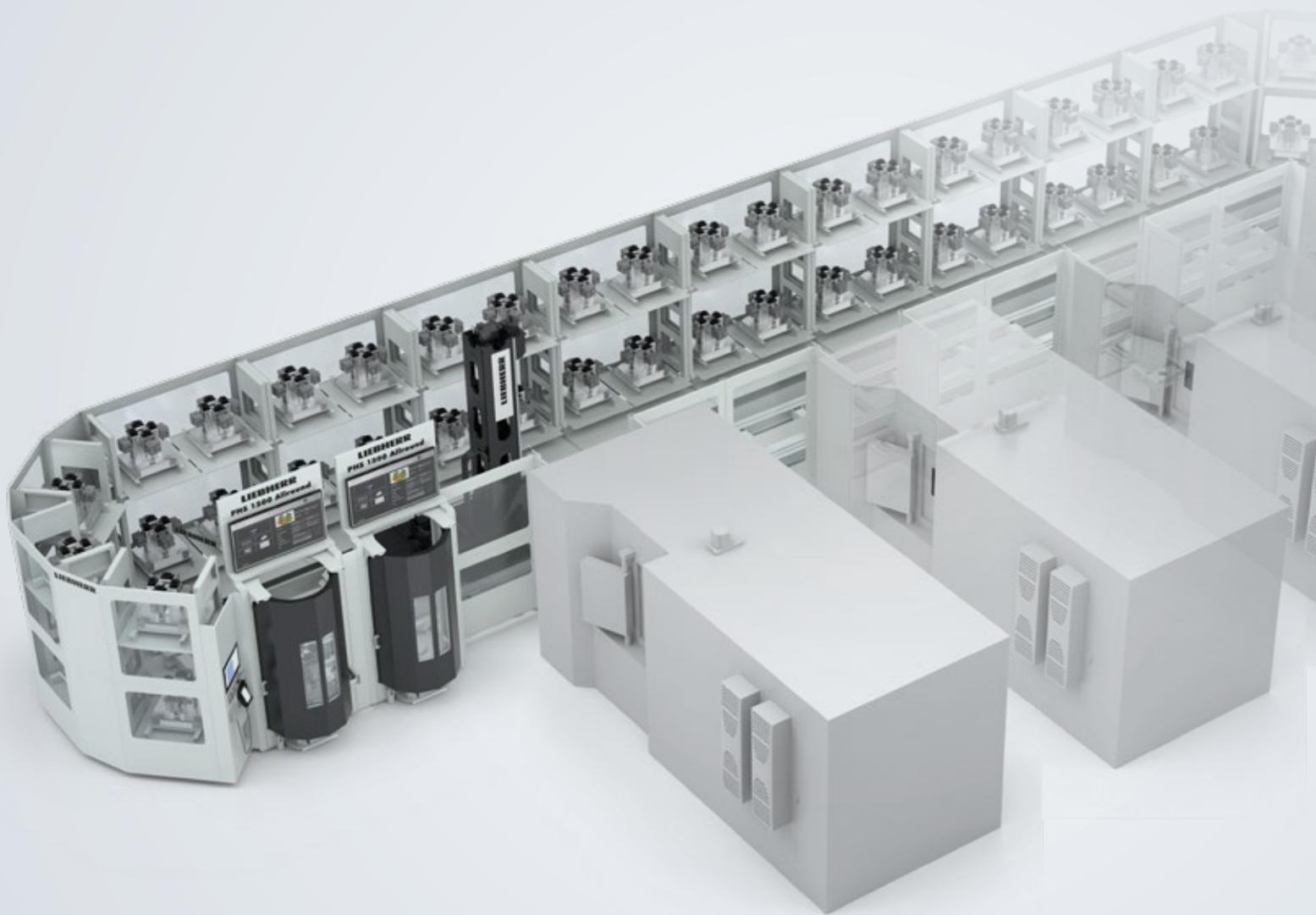
## Pallet handling system

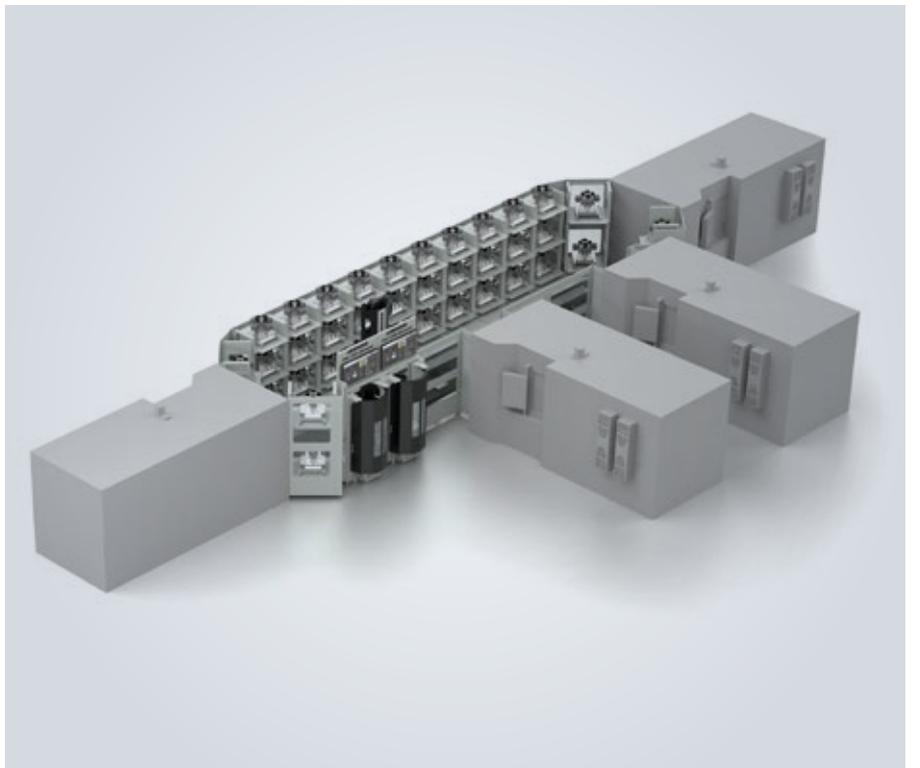
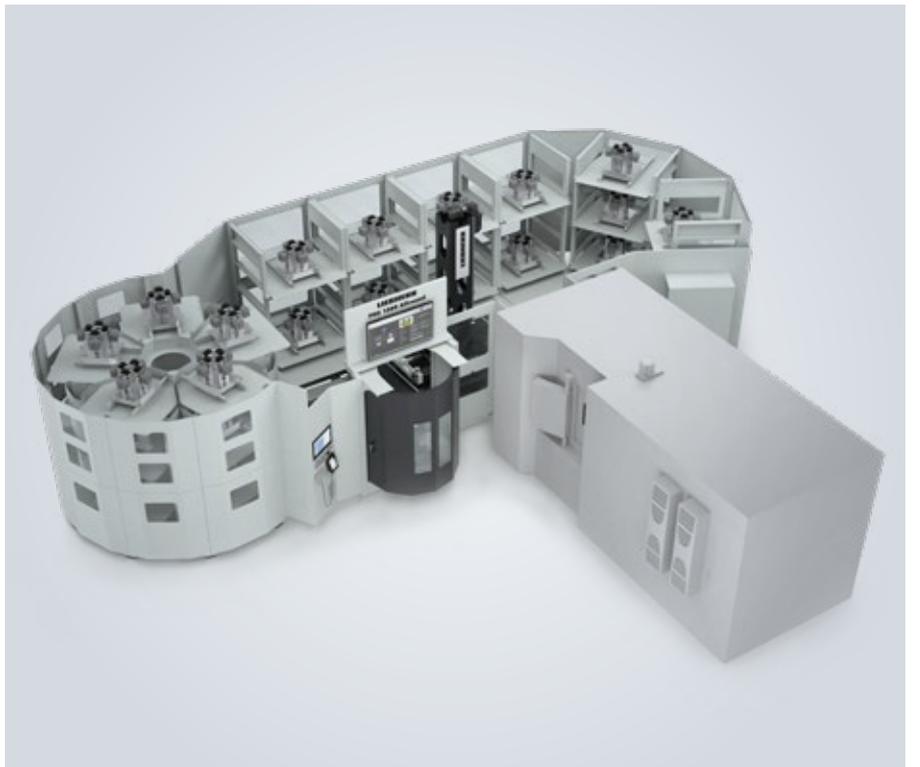
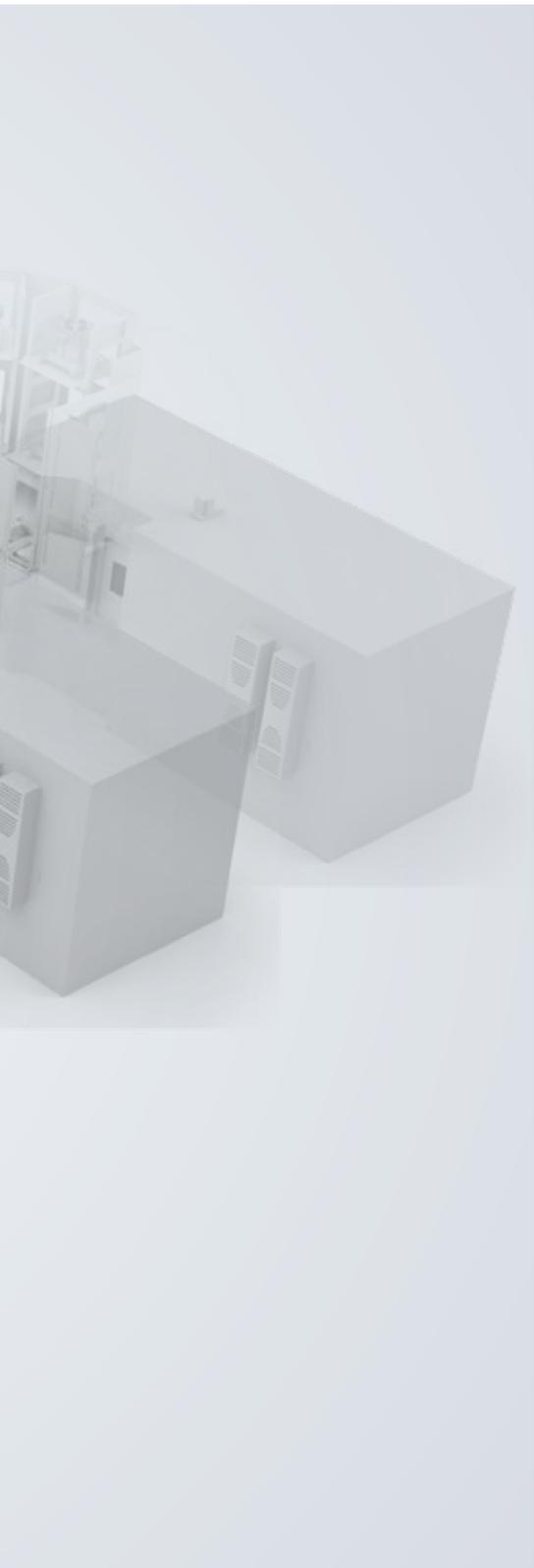
	Collision circle diameter (mm)	Transport load, single loader (double loader) (kg)
PHS 800 Allround	600/900	800 (2 x 600)
PHS 1500 Allround	900/1,400	1,500 (2 x 1,200)
PHS 3000 Allround	1,400/1,700	3,000



Video: PHS Allround  
<https://go.liebherr.com/87KD2N>

# Examples and types of layout







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# PHS PRO

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The linear pallet handling system PHS PRO leaves nothing to be desired: This product line can be flexibly scaled like no other. There is no limit in terms of length, height or number of machines. Up to 13 tonnes of transport weight are possible in the standard version, and even more in the special versions. The shelf modules used are adapted to individual requirements and designed according to the customer's wishes. This makes optimal use of the available space.

In this holistic system concept, raw and finished part management can also be integrated as well as pallet management. In this case, there is also an area for material pallets as well as the storage system for machine pallets. Raw and finished parts are temporarily stored here and make surrounding logistics easier: Large input and output stations can be omitted, parts are fed in or removed according to need.

Liebherr uses the proven module design for the PHS PRO as well. This enables individual adaptation to customer application. The number of attached machines, setup and storage locations is variable. As well as the four standard sizes, Liebherr also implements special solutions for specific tasks, for example an intermediate storage area for refrigerator housings or buffer storage in manufacturing lines.



Lift module



Shelf module



Setup station

## Modular system

Four sizes meet the requirements of a large range of users. Within each size, intermediate sizes are available with different load capacities, so that the system is adapted to the respective application case. The PHS PRO modular system consists of the following elements:

- Lift module
- Telescopic unit
- Shelf module
- Setup station
- Optional: front access
- Optional: telescope adjustment

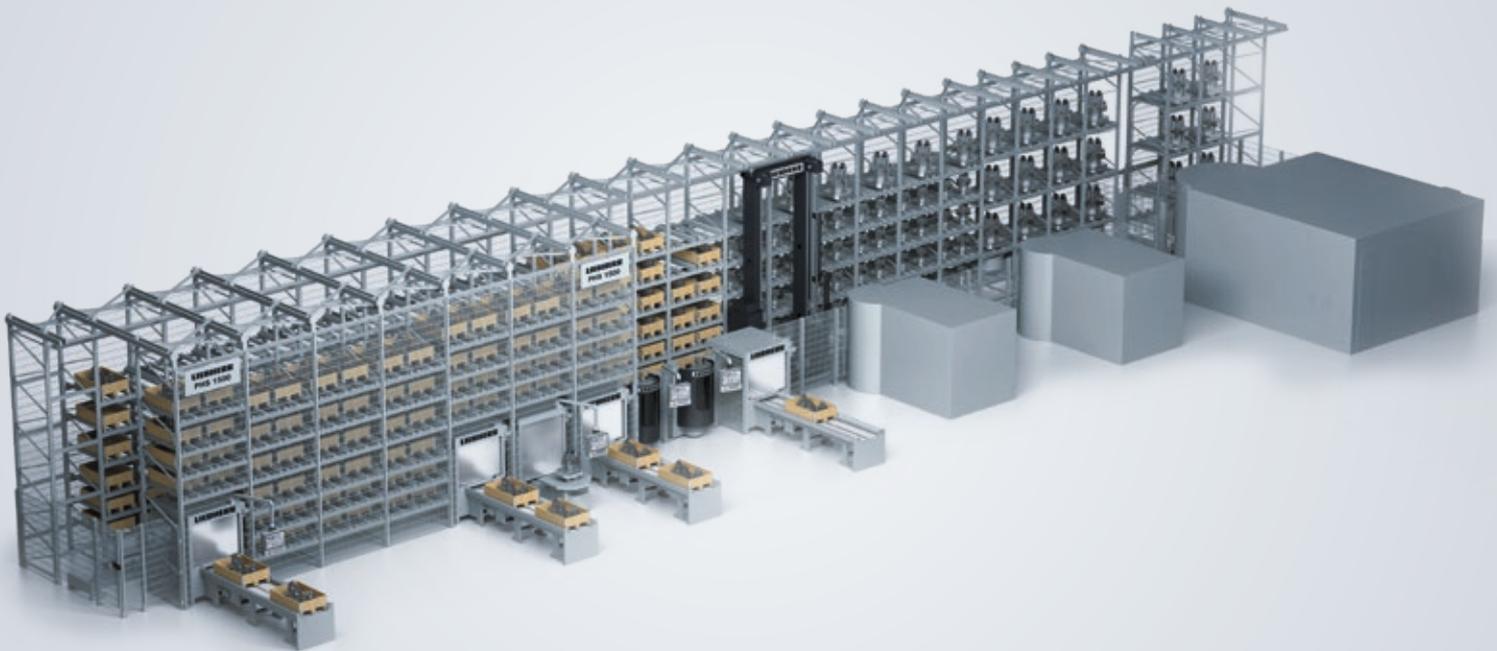
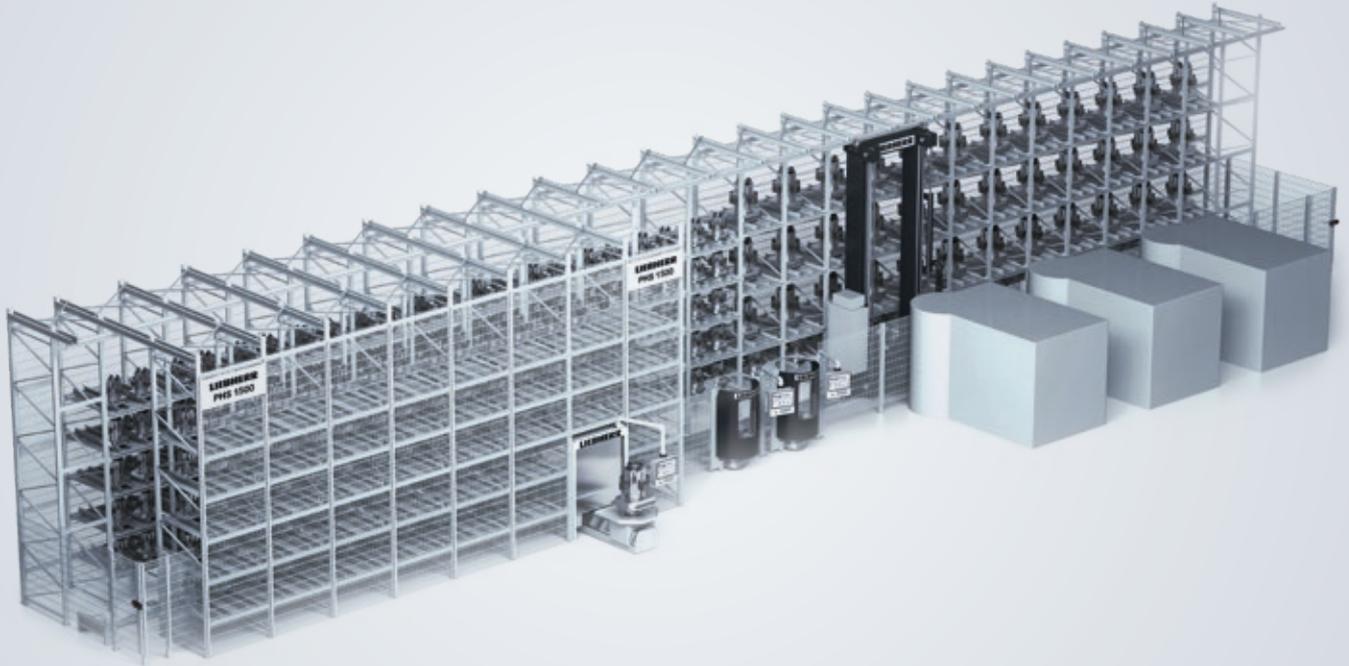
If different pallet types are to be handled in one system, a laterally adjustable telescope may be necessary. This enables the integration of different machine sizes and types.

All the assembly modules can be configured individually. For example:

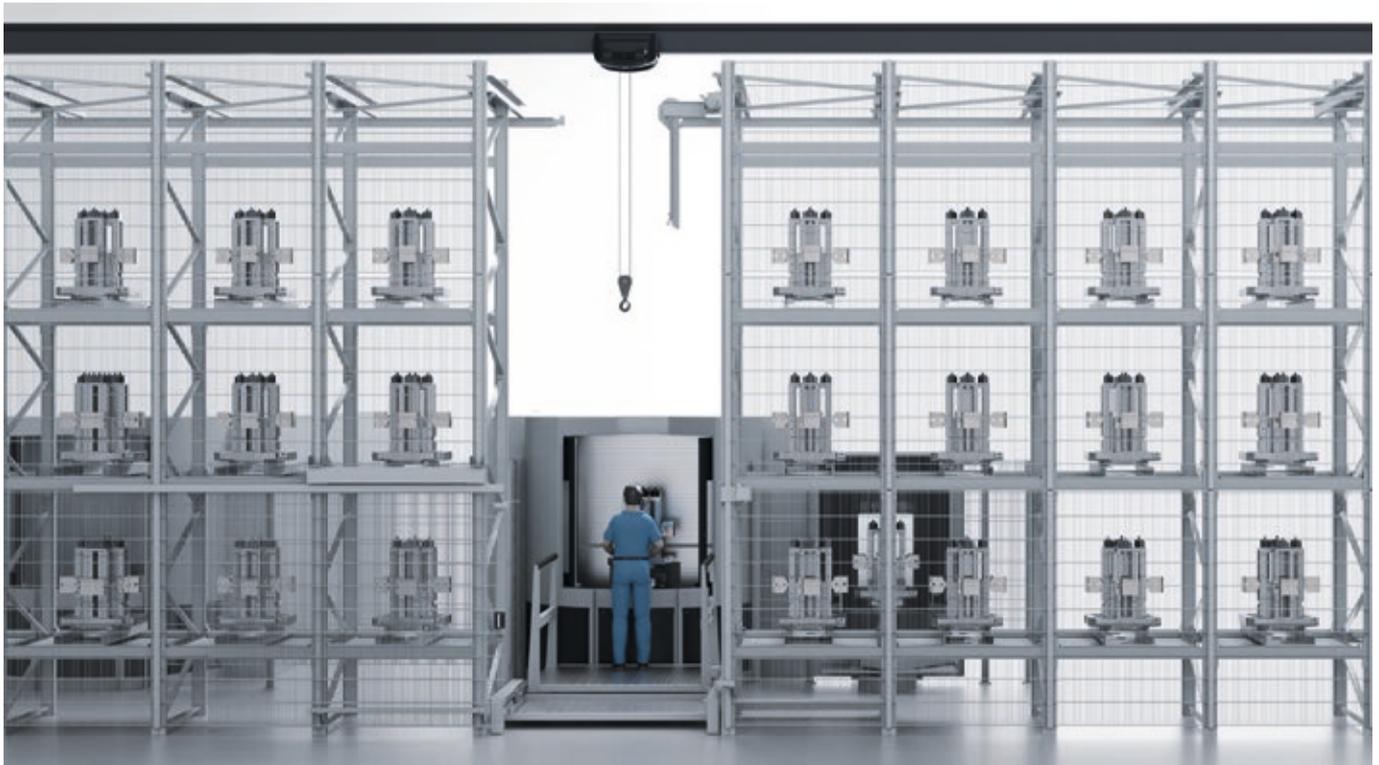
- Machine and material pallet handling
- Different machine types and sizes
- Different setup stations Integration of additional devices such as washing, measuring or deburring.

Different shelf divisions, single- or double-sided shelf, machine and variable setup station arrangements are therefore feasible.

# Examples and types of layout



# Technical data



## Pallet handling system

	Collision circle diameter (mm)	Transport load (kg)
PHS 750 PRO	1,000/1,400	500 / 750 / 1,200
PHS 1500 PRO	1,000/1,400/1,700	1,500 / 2,000 / 2,500
PHS 3500 PRO	1,900 / 2,700	3,500 / 5,000 / 6,500
PHS 10000 PRO	3,200 / 4,000 / < on request	10,000 / 13,000 / < on request



Video: PHS PRO  
<https://go.liebherr.com/2U3924>



Video: PHS 1500 PRO  
<https://go.liebherr.com/16u324>



Video: PHS 10000 PRO  
<https://go.liebherr.com/3x8713>

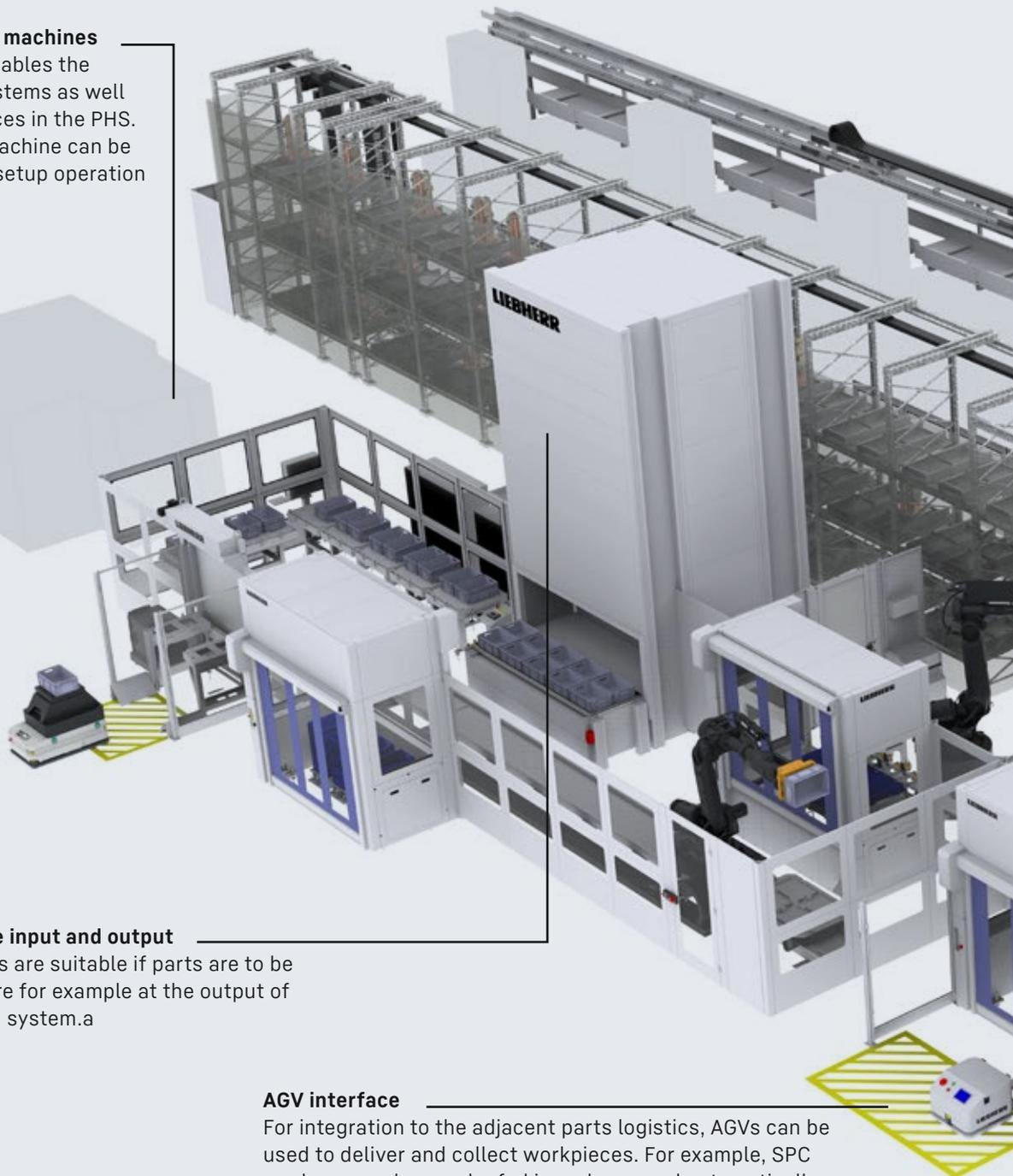
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# System competence at a glance

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## Integration of standalone machines

The flexible cell control enables the integration of adjacent systems as well as management of resources in the PHS. For example, a separate machine can be attached for the test and setup operation in the control system.



## Buffer storage for the line input and output

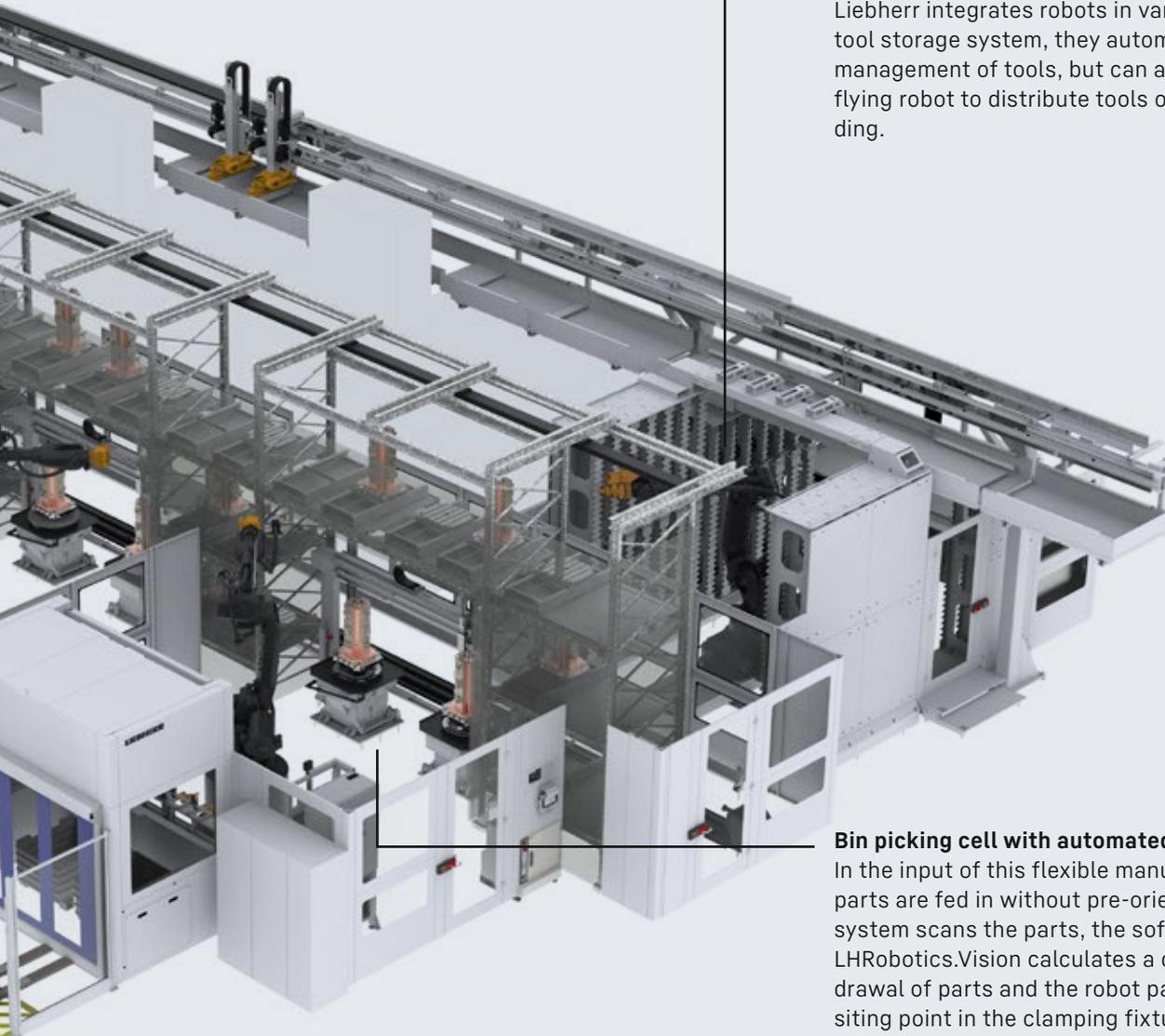
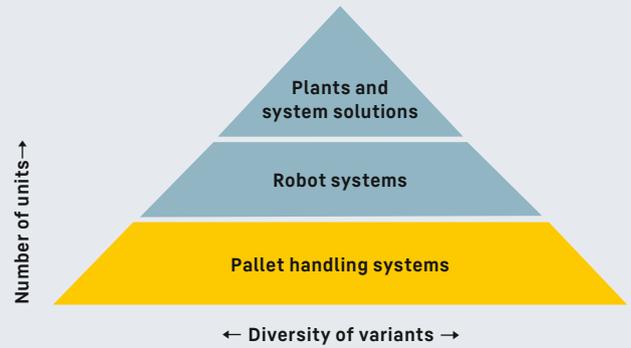
Additional storage systems are suitable if parts are to be stored without pallets, here for example at the output of the flexible manufacturing system.

## AGV interface

For integration to the adjacent parts logistics, AGVs can be used to deliver and collect workpieces. For example, SPC random samples can be fed in and removed automatically, but the general parts supply could also be achieved using automated guided vehicles.



Discover all  
our product areas:  
[www.liebherr.com/AS](http://www.liebherr.com/AS)



**Tool storage with robot**

Liebherr integrates robots in various ways. In the tool storage system, they automate the central management of tools, but can also be used as a flying robot to distribute tools or for machine loading.

**Bin picking cell with automated setup**

In the input of this flexible manufacturing system, parts are fed in without pre-orientation. A vision system scans the parts, the software product LHRobotics.Vision calculates a collision-free withdrawal of parts and the robot path up to the depositing point in the clamping fixture. The robot picks up the workpieces and sets them up on pallets which are fed into the PHS. Machines could also be directly loaded in the same way.

# Tool Handling Systems THS



Central tool storage with flexible shelf modules

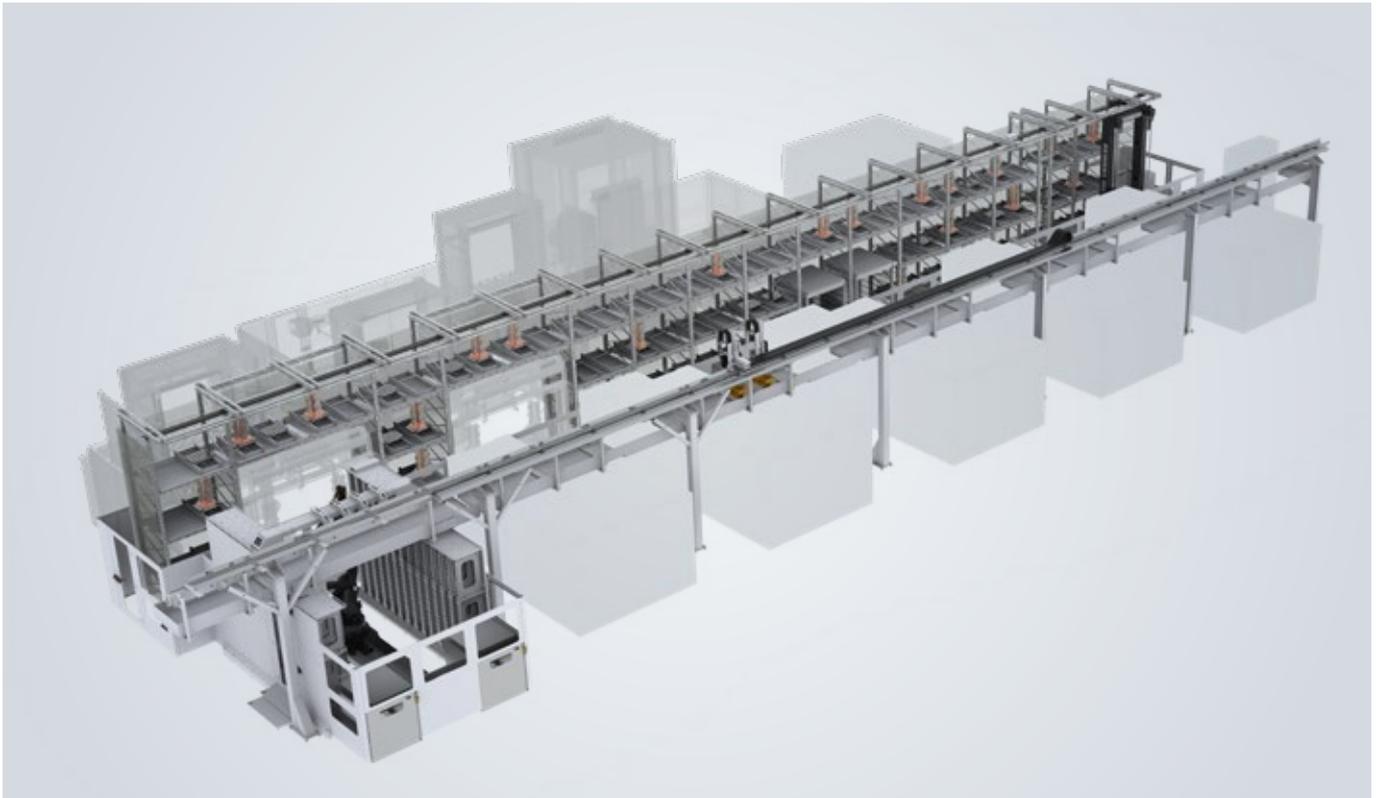
Systems with a high tool requirement require large tool magazines, e.g. if there is a large variance of parts or if high-strength materials are to be machined. The storage capacity of the machining centers can reach its limits in this case. Frequent changing of tools on several machines would then be necessary – taking up considerable organizational and personnel time.

In order to avoid this and to guarantee unmanned manufacturing over a long period of time, Liebherr offers tool handling systems. A THS consists of a central storage system and a tool distribution system which feeds the tools into the interlinked machines. Liebherr's tool handling systems have a modular design and are available in different variants. Each system can be adapted to the respective tool requirements, the individual spatial conditions and different mountings (HSK, SK, etc.).

## The advantages of a THS

- Elimination of manual tool change
- Reduced personnel requirements
- Management of several thousand tools possible
- Space-saving alternative to decentral, i.e. dispersed storage
- A central point of contact for all tools, no unnecessary searching times
- Cost saving due to central availability of special and sister tools

The cell control ensures a perfect overview. It coordinates tool management, including all data, and ensures a continuous flow of information. Error costs caused by incorrect tools or faulty data transmission are eliminated. Resource planning ensures that the necessary tools are available according to need. This produces fewer standstill times and a higher machine runtime.



Central tool storage with gantry loader LP for distribution over five machining centers

## Central tool magazine

The Liebherr tool storage system stores tools on shelves with a large storage capacity. The magazine modules can be arranged flexibly and extended, creating storage capacities of several thousand tools.

The tools in the storage system are handled by a robot. A separately selectable distribution system is responsible for the transport and changing in of tools into the machining centers. The tools are stored and removed via a feed station in the storage area. There, the tools are identified and the data are transmitted to the cell control.

## Distribution system – can be flexibly combined

The Liebherr gantry loader LP achieves maximum cycle times. Grippers, axes and compensator equipment, if needed, are adapted to the machine tools in the system. The alternative is a robot portal RP, which provides maximum flexibility and is also suitable for difficult loading situations.



**LIEBHERR**

Haulotte

# Service over the entire life cycle

## Worldwide presence and spare parts availability

With our main location in Kempten, Germany and global offices and service support points, we guarantee very fast response times which enable us to dispatch a service engineer to the customer location immediately if necessary. Our range of services includes inspections, training, individual spare part packages, remote support and maintenance or conversion of systems.



### Individual spare part packages

The right spare parts for every situation, at your location

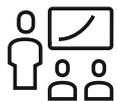
- "Start-up" for a smooth production start
- "Maintenance" to maintain the productivity of your machines



### Inspection\*

Preventative analysis of the machine condition

- Analysis log with recommendations for action based on field experience
- Implementation based on the customer's individual maintenance strategy



### Training offers

Effective technical training for operators, maintenance personnel, planners

- Attachment of workpieces, processing start and error detection
- Electronics/mechanics, part exchange, inspection records
- Application expertise



### Remote support\*

Fast and uncomplicated assistance by remote access in case of malfunctions

- Function tests and troubleshooting
- Rectification of software problems by remote maintenance
- Support for mechanical challenges provided by Liebherr experts

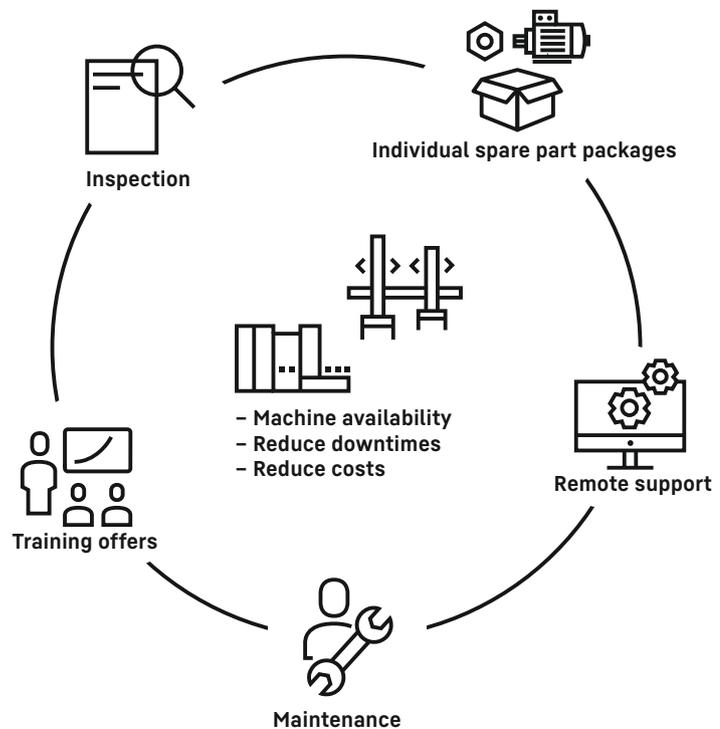


### Maintenance\*

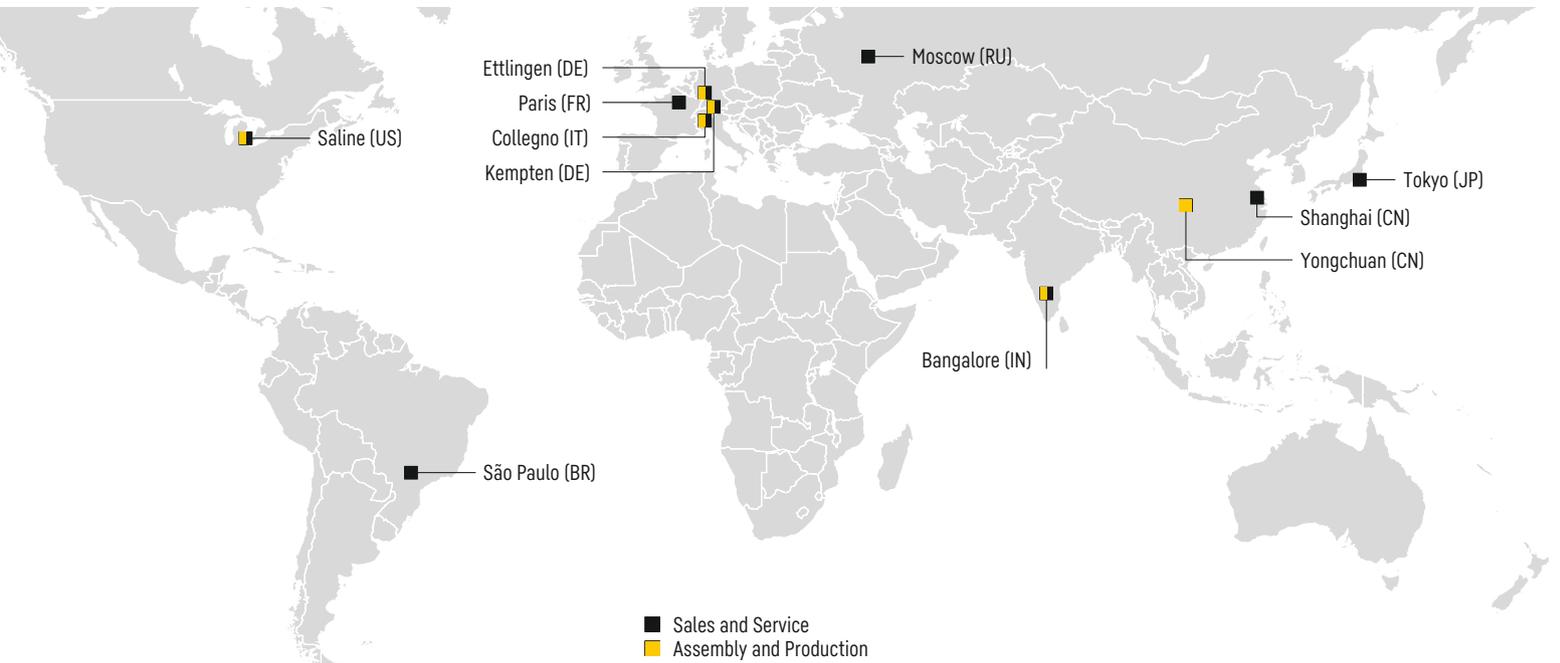
Safeguarding machine availability

- Analysis log with recommendations for action based on field experience
- Replacement of standard wear parts
- Professional testing of individual machine parts

\*individually or as part of the contract



# Your solution provider



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