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# From individual parts to series production

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## Automation system product portfolio

Our product range offers automation possibilities for all types of manufacturing modes. From flexible cells to production lines, from one unit to mass production.

# LIEBHERR

Automation systems



# Liebherr – your partner for automation systems

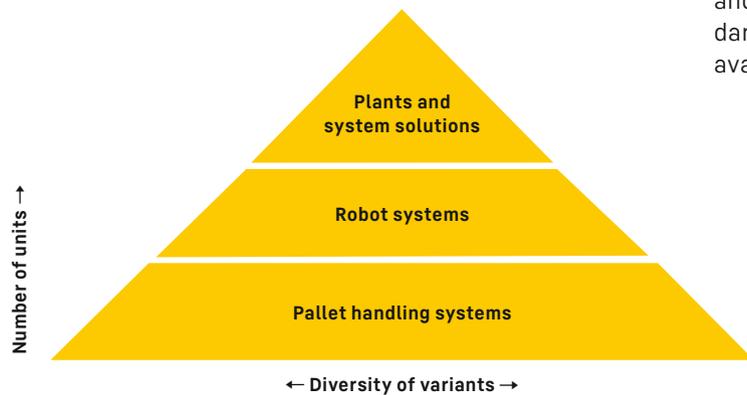
Liebherr offers a wide range of automation systems for modern, high-efficiency manufacturing. These solutions help to reduce production costs and enable a flexible response to changes in the market; systems can be retroactively expanded, maximizing production capacity or adding additional functions. Our focus is on ensuring that our products are cost-effective, user-friendly, high-quality and reliable, with great flexibility.

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

We combine these products intelligently to form flexible manufacturing cells, robot systems or manufacturing systems for small and large projects, from one unit through to mass production.

**Our broad product portfolio allows us to deliver automation for a variety of applications and industries.**

- Automation for manufacturing lines in the automotive sector, e.g. crank shaft, engine block
- Flexible manufacturing cells with bin picking technology as line feed
- Assembly solutions for e-mobility, e.g. battery pack assembly
- Automation from a batch size of one using pallet handling systems for machine construction or aviation
- Automated tool handling using central warehouses and distribution systems



Our product areas for diverse requirements

## Economy

Liebherr automation systems increase the productivity and efficiency of your machining processes.

## Flexibility

Our products are designed according to a modular principle, are freely configurable, and can be optimized to meet your requirements.

## User-friendliness

Ergonomics and occupational safety, user-friendly interfaces, and intelligent software make your operators' day-to-day work as easy as possible.

## Quality and reliability

Quality is the ultimate priority at Liebherr. Liebherr-Verzahntechnik GmbH's quality management system is certified in accordance with ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018, as well as VDA 6.4. This high standard means that our automation systems guarantee high availability and part quality for the end customer.



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



Liebherr-Verzahntechnik GmbH offers an extensive range of tools, machine tools and automation systems. The independent business division of the Liebherr Group employs around 1,700 people at its production sites in Kempten, Ettlingen, Karlsruhe, Bangalore (India), Yongchuan (China), Saline (USA) and Turin (Italy).

The Automation Systems division has been providing turn-key production installations, automating high-efficiency manufacturing cells, and manufacturing lines in collaboration with well-known machine manufacturers worldwide since the 1970s.

Thanks to its high level of in-house manufacturing depth, most of the mechanical manufacturing, metal plate machining, painting and component assembly takes place directly at the Kempten site.

Liebherr Automation Systems delivers systems throughout the world worth €65 million per year, of which 90% of the deliveries have been to manufacturing firms outside the Liebherr Group. The export proportion is 75%.

### Sales figures per division of LiebherrVerzahntechnik GmbH



- Gear cutting machines and measuring technology
- Automation systems
- Gear cutting tools

### Sales figures per segment of LiebherrVerzahntechnik GmbH



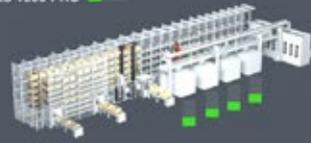
- Automotive
- Automotive suppliers
- Trucks
- Agricultural and construction machinery
- Aerospace
- General machine construction
- Other

**LIEBHERR**

CELL CONTROL SYSTEM



PHS 1500 PRO



RLS 800



Setup Station

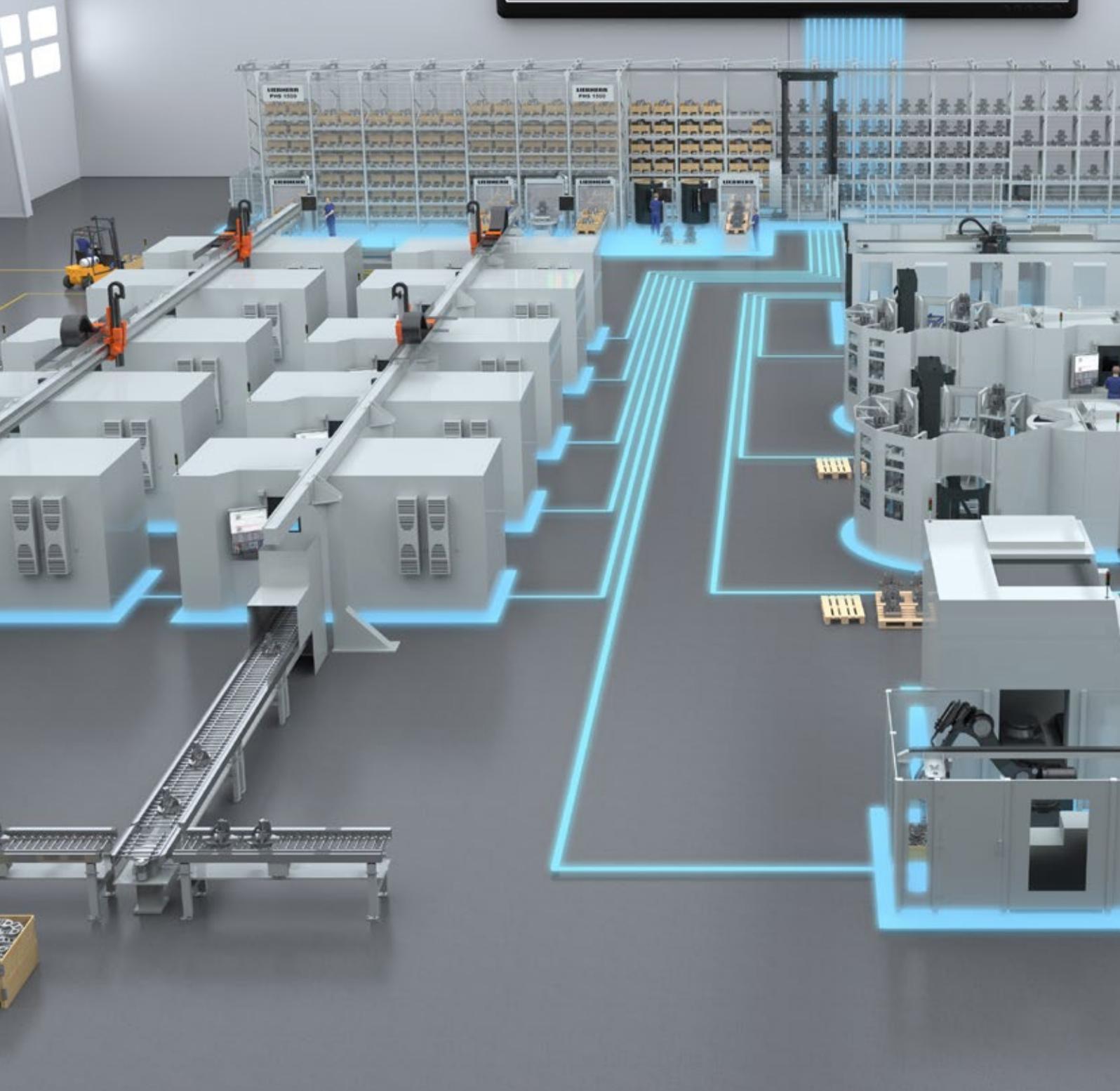
LC 180CC

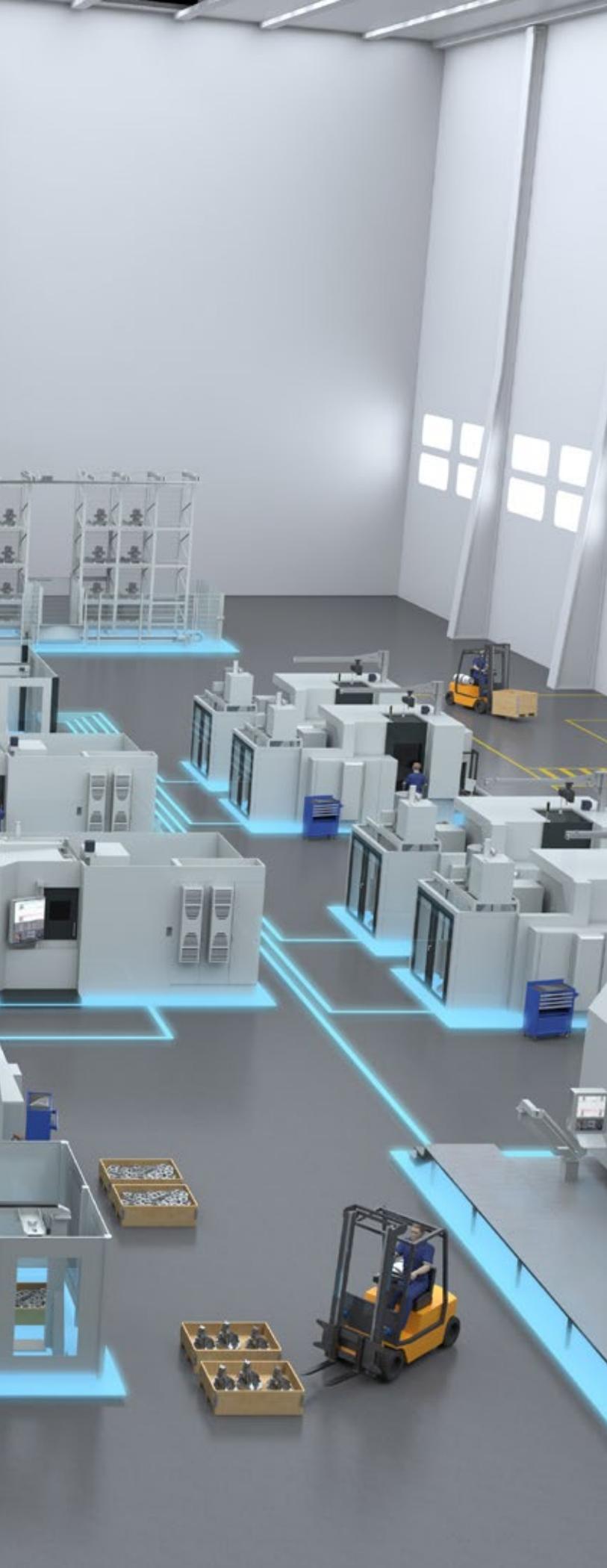


LGG 500



LGG 700M





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# Gantry robot



LP 100



LP 200



LPR 200



LP 2000

Liebherr gantry robots can be deployed in a variety of ways: transporting, palletizing, goods handling, loading and unloading, or storing. Linear and area gantry robots with load capacities up to 1,000 kg perform a wide range of automation tasks. For all sizes, Liebherr offers a modu-

lar system that allows the automation system to be adapted to a specific application, such as the manufacturing of cylinder heads, engine blocks, or gearboxes.

## Linear gantry robots

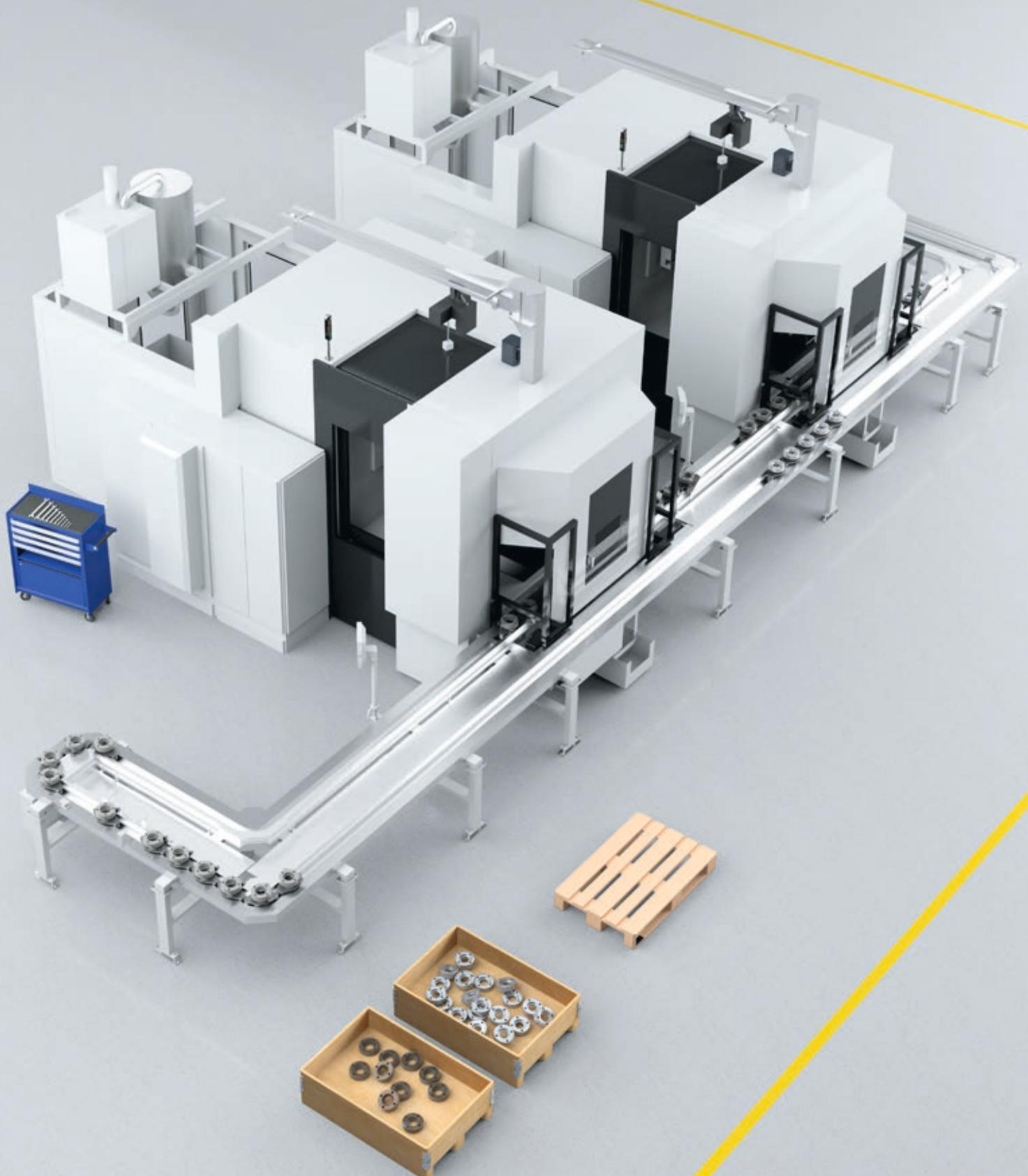
|                   | Load capacity (kg) | Traversing speed X (m/min) | Acceleration X (m/s <sup>2</sup> ) |
|-------------------|--------------------|----------------------------|------------------------------------|
| LP 20             | 160                | 180                        | 4                                  |
| LP 100            | 200                | 180                        | 3                                  |
| LP 100 High Speed | 200                | 300                        | 4.5                                |
| LP 100 Heavy Duty | 280                | 180                        | 2.5                                |
| LP 200            | 600                | 180                        | 3                                  |
| LP 2000           | 1,000              | 120                        | 2                                  |

Further load capacities available on request

## Area gantry robots

|          | Load capacity (kg) | Traversing speed X (m/min) | Acceleration X (m/s <sup>2</sup> ) | Traversing speed Y (m/min) | Acceleration Y (m/s <sup>2</sup> ) |
|----------|--------------------|----------------------------|------------------------------------|----------------------------|------------------------------------|
| LPR 20   | 160                | 180                        | 4                                  | 120                        | 3                                  |
| LPR 200  | 600                | 180                        | 3                                  | 120                        | 3                                  |
| LPR 2000 | 1,000              | 120                        | 2                                  | 120                        | 2                                  |

Further load capacities available on request

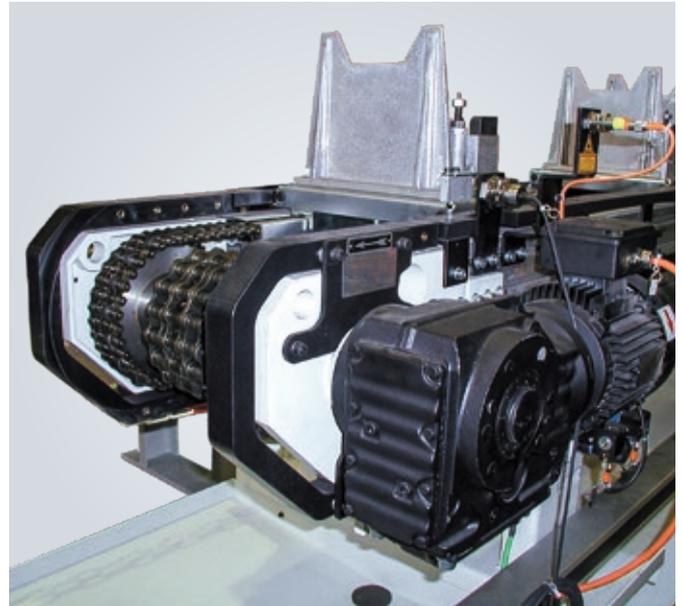


# Conveyor systems

Liebherr conveyor systems are adapted not only to the shape, position, weight and size of the range of parts, but to the material as well. Standardized assemblies provide an ideal supplement to our range.



Plastic chain conveyor



Pallet accumulating conveyor

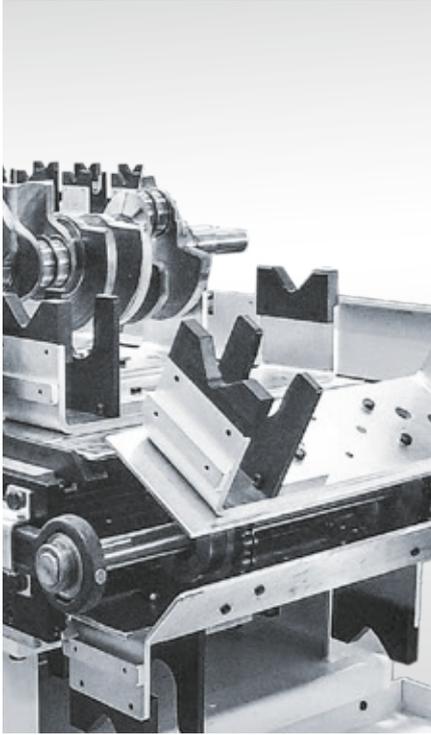
## Plastic chain conveyor (KKB)

Plastic chain conveyors from Liebherr are designed to transport any number of irregularly shaped workpieces without them coming into contact with each other. The workpieces are transported on pallets. The queue effect means that they are cycle-independent.

## Pallet accumulating conveyor (PSB)

Pallet accumulating conveyors are also used to transport any number of irregularly shaped workpieces without them coming into contact with each other; here too the workpieces are transported on pallets. The queue effect means that they are cycle-independent. The pallets are returned on the underside of the conveyor to save space.

# Conveyor systems



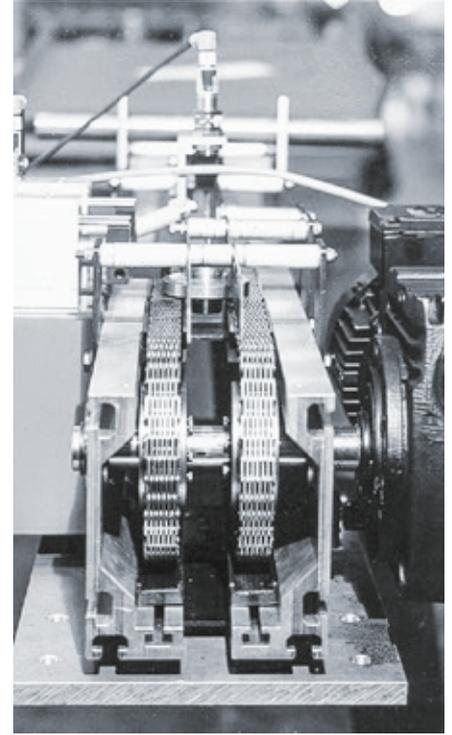
## Indexing chain conveyor (TKB)

Indexing chain conveyors are used to transport parts on workpiece carriers. They are permanently joined to the drive chain and are conveyed in a cycle-dependent manner.



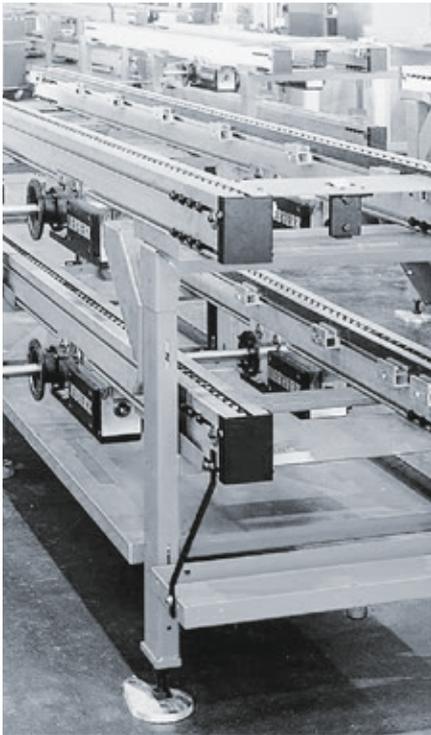
## Hinged chain conveyor (SKB)

Using hinged chain conveyors, it is possible to transport workpieces that have a flat transport surface, e.g. gear wheels. Depending on requirements, multi-lane versions are also possible. By joining individual belt sections together, hinged chain conveyors can be extended to any length. The queue effect means that they are also cycle-independent.



## Tooth chain conveyor (ZKB)

Tooth chain conveyors transport workpieces that do not have a flat transport surface, e.g. those with pins or tool flanges. By joining individual belt sections together, cycle-independent tooth chain conveyors can be extended to any length.



### Accumulating conveyor (SFB)

Using accumulating conveyors, it is possible to transport workpieces either directly or on pallets. By joining individual belt sections together, the transport length can be extended as required; accumulating conveyors are also cycle-independent.



### Drag frame conveyor (SRB)

Drag frame conveyors are used to transport parts with a flat transport surface, e.g. toothed gears, hubs or rings. Workpieces are dragged using a frame connected to a chain. They are either transported directly on the transport conveyor or indirectly via workpiece carriers. The prismatic mountings normally make change parts unnecessary.



### Friction roller conveyor (FRB)

Using friction roller conveyors, workpieces can be transported directly or on pallets. In this case, the transport length can be extended as required by joining individual sections together. The queue effect means that they are cycle-independent. The friction principle means that the transport surface on the workpiece is not damaged.

# Storage systems



LPC palletizing cell



Decoupling module EKM

Storage systems for workpieces can be deployed in a variety of ways: for decoupling on a manufacturing line, as a loading/unloading device, or as a classic logistics module with storage functionality.

## LPC palletizing cell

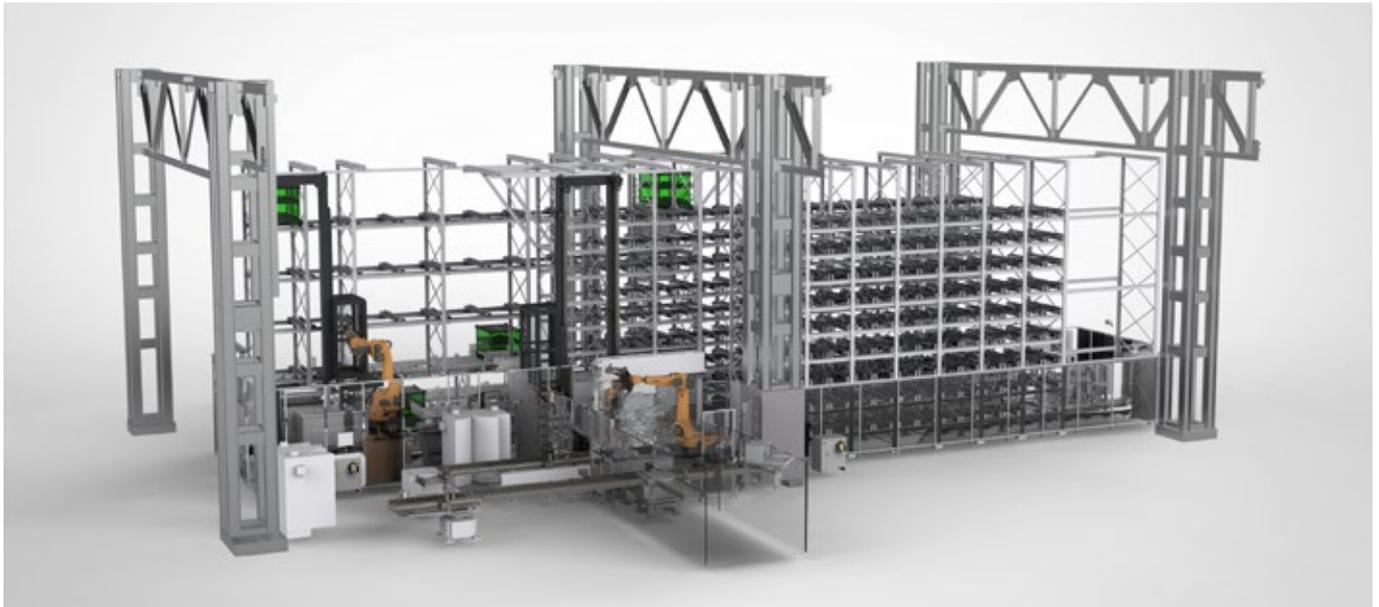
A wide variety of different production concepts can be implemented using the Liebherr palletizing cell, whether in production islands for loading individual machines, in cell systems with blank and finished part storage systems, or as a decoupling module in a manufacturing line. The palletizing cell interrupts the process sequence, creating buffer times and reducing employee workload. Standardized transport containers with basket technology help to streamline logistics. Workpieces remain in a wire basket or workpiece carrier along the entire material flow.

## Decoupling module EKM

The decoupling module is used for storage and decoupling in manufacturing lines. It has a high storage capacity with a small surface area requirement and is suitable for a very wide range of workpieces and production concepts. Workpieces are placed on pallets in the decoupling module and made available to gantry or robot systems via pull-out mechanisms to allow loading and unloading. A manual loading and unloading drawer for gauge parts can be integrated if needed.



**Video:**  
**Flexible production networking**  
<https://www.youtube.com/watch?v=RBi5EZcz0r8&list=PLC5481F2D19BB6A5F&index=12>



Pallet handling system (PHS) with robot cells as end-of-line storage

## Shelf magazine with gantry loader

A shelf magazine system combines fixed workpiece clamping fixtures with a gantry portal system. The shelf magazine can be loaded either from the top or from the side. Due to its modular design, the overall system can be extended as far as required and, depending on the layout, enables storage based on the “first in, first out” principle.

## Shelf magazine with pallet handling system (PHS)

In a PHS, workpieces can be stored on pallets or parts in load carriers such as wire baskets or Euro pallets. High-bay shelves with large storage capacities can compensate for fluctuations, for example as systems for “end-of-line” storage prior to loading onto trucks. High-performance storage and retrieval units can move loads weighing several tonnes.

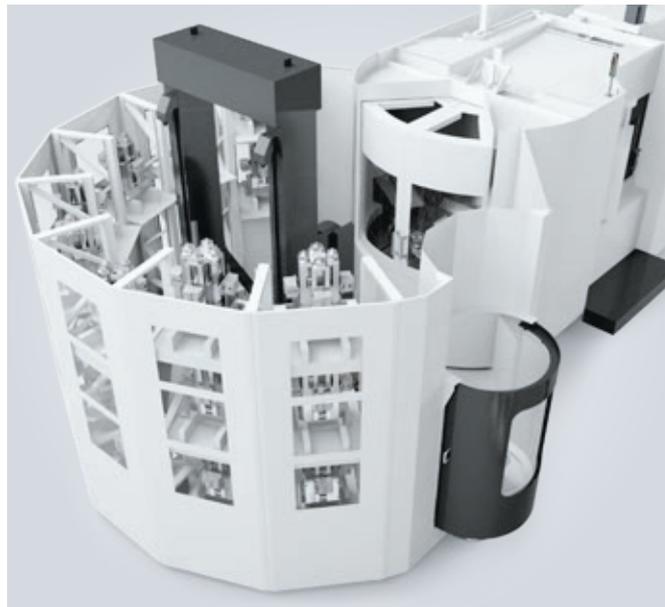


Video: PHS PRO  
<https://go.liebherr.com/2U3924>

# Pallet handling systems



Liebherr pallet handling systems are used to automate machining centers in the area of individual part and small batch manufacturing. The pallet handling system automates the temporary storage of machine pallets with workpieces clamped to them before distributing them to the machining centers. This intelligent overall concept, which includes retooling during the machining process as well as resource and order scheduling, increases productivity and reduces unit costs. Pallet handling systems from Liebherr are available in two versions: a rotary loading system (RLS) or a linear loading system (PHS). Both system versions are modular in design and can be adapted to the requirements of the production concept.



## Rotary loading system RLS

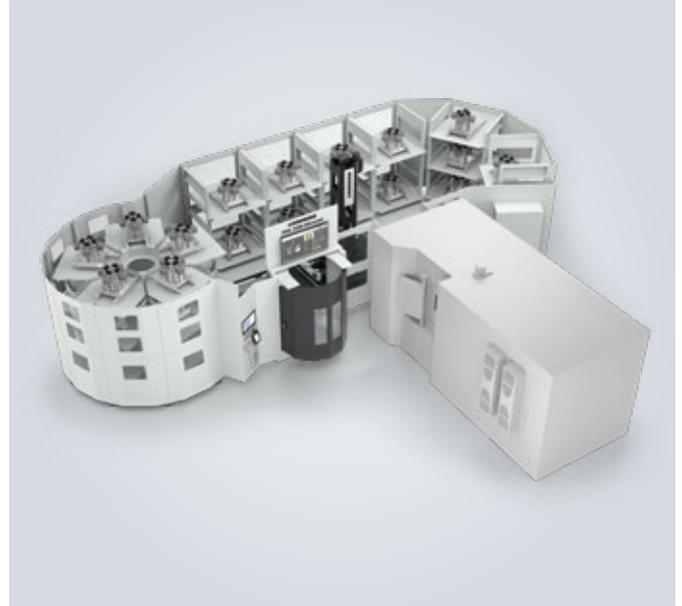
Rotary loading systems from Liebherr have a high storage depth in relation to their footprint and are designed for one or two machining centers. In combination with a Liebherr rotary storage tower (RTS), storage locations can be customized to meet specific needs. The rotary loading system is available in two sizes and is designed for transport loads from 800 kg to 1,500 kg.

### RLS

|          | Collision circle diameter (mm) | Transport load (kg) | Storage locations |
|----------|--------------------------------|---------------------|-------------------|
| RLS 800  | 600 / 800                      | 800                 | 14 to 36          |
| RLS 1500 | 900 / 1,300                    | 1,500               | 10 to 33          |



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



## Pallet handling system PHS PRO

In the linear-type pallet handling system, the number of connected machines can be adapted to the requirements, as can the setup and storage locations. The flexibility to extend and optimize the system with the proper mix of finished part storage and unprocessed part management on material pallets meets the requirements of the modern manufacturing process. The linear system is manufactured in four sizes for transport loads up to 13,000 kg.

### PHS PRO

|               | 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 |

### PHS Allround

|                   | 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  |

## PHS Allround pallet handling system

The modular PHS Allround system can be individually configured and expanded at any time. The possibility of a frontal arrangement of machines, additional units and shelves offers maximum flexibility in the system design. The double loader option eliminates unnecessary stand-stills of the machine tool and replaces the machine's own pallet changing system, making a pallet handling system with a double loader the more cost-effective alternative. The detachable front access allows individual machines to be decoupled from the system, without interrupting the automatic mode of the remaining machines.



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



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



# Robot systems

Liebherr provides robot cells for automated feeding of blanks and removal of finished parts in production facilities in the powertrain and bodywork sector and has extensive expertise in the field of systems and software for object detection independent from the camera system. Liebherr robot systems perform parts handling, palletizing/depalletizing and bin picking tasks along the process from blank to finished part. Machining processes are highly customized, meaning that flexible products are needed. Our robot systems are unmatched in terms of versatility and provide economic solutions from “line in” to “line out”.



Line inlet for engine block production



Flexible cell for machine loading

## Parts feed – Liebherr moves all parts into place

Automation is needed even at the very beginning of the process: depending on how the parts are supplied, Liebherr offers technology to help position workpieces. This can be achieved using a standardized robot cell for depalletizing purposes, either with pre-programmed motion sequences or a 2D to 3D vision system. If the requirements are complex, a standardized robot cell is combined with sophisticated bin picking technology.

## Machining – flexible cells for flexible applications

Liebherr robot cells can be used to automate individual process steps in manufacturing lines or systems. There are many different possible applications, for example for sorting and picking tasks or for additional tasks such as cleaning, marking or deburring.

## Parts removal – Ready your parts for the next step

Parts removal is the counterpart to the line inlet. Depending on the requirements of the subsequent process (or loading), a robot at the line outlet provides the parts as required.

3D robot vision applications can be supported by our LHRobotics.Vision technology package. This software calculates the robot's path for collision-free removal and transport to the stacking location.

# Additional device

When it comes to setting up manufacturing systems for performing complex tasks, Liebherr supplies not just the basic products, but also any and all additional devices required. For example: labeling, detection by camera systems, orientation or centrifugation of oil-coated parts, and discharge of gage parts using an SPC station.



SPC drawer

## Statistical process control (SPC)

The statistical process control is a fixed element of any production line in modern manufacturing systems. Liebherr supplies modular stations for rejecting and loading random samples according to your quality strategy.



Orientation station

## Orientation station

Modern production machines require that workpieces are loaded with the correct orientation. If the loading system is incapable of doing this, Liebherr offers ancillary orientation stations.



Camera system in a crank shaft line

## Camera systems

With the aid of camera systems, labels and codes on the workpieces can be read and their information transferred to higher-level production management systems.



Oil thrower

## Centrifugal station

To prevent the displacement or mixing of cooling lubricants, it is necessary for the workpieces to be cleaned automatically. Depending on the needs of the customer and the workpiece, different processes are employed. Liebherr's modular system comprises centrifugal vacuum and blow-off stations.

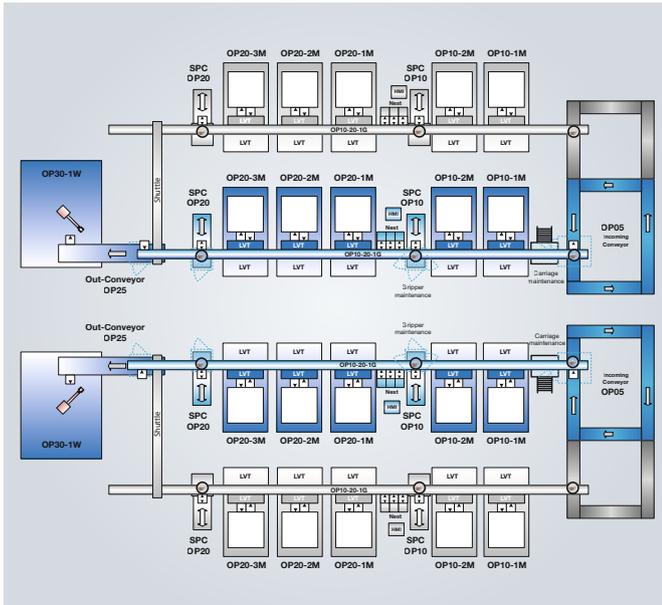


DATA matrix code (DMC)

## Labeling systems

With the high-quality labeling systems offered by Liebherr, number combinations or codes can be lasered, etched or engraved onto the workpiece using a needle.

# Control and software



Simplified control structure



Liebherr Manufacturing System (LMS 4.0)

## Customer-specific complete solution based on the modular system

The comprehensive modular hardware and software system ensures continuity between a mechanical function and the hardware and software functions needed for it. Tested software modules with a functional description are configured as a complete solution according to the required functions. Even before the contract is awarded, a detailed customer-specific process description is created (sequence of operation – SoO).

## Additional software increases process reliability

Complex production systems require a universal, intelligent system concept. With the Liebherr Manufacturing System (LMS 4.0), Liebherr offers user-friendly additional software that safeguards process reliability on a production or assembly line.

The LMS 4.0 can temporarily record parts tracking, as well as save specific data, and make this available to all system users. The system offers a wide range of evaluation functions and can be deployed, for example, to monitor correct adherence to the production process.

The addition of new functionalities, such as the “production monitoring app” and “info board app”, allows process sequences to be easily tracked on mobile devices and interfaces.



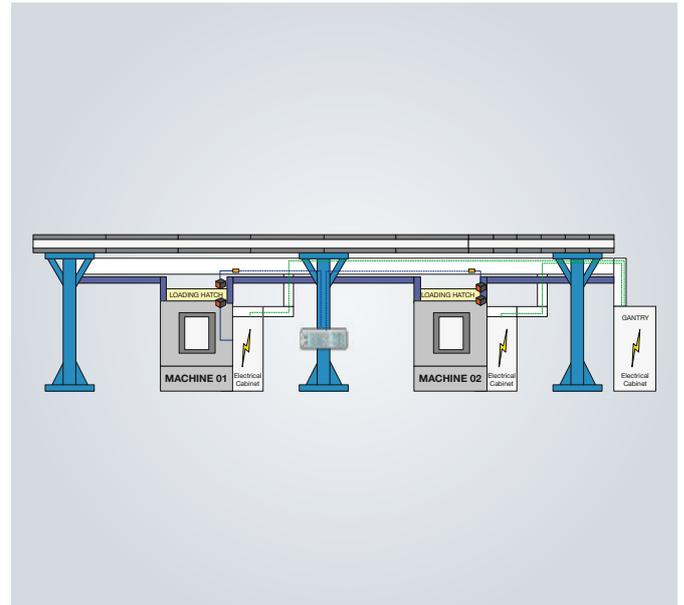
Video:  
LMS 4.0  
[https://www.youtube.com/watch?v=\\_Ve6ECD9ryU&list=PLC5481F2D19BB6A5F&index=3](https://www.youtube.com/watch?v=_Ve6ECD9ryU&list=PLC5481F2D19BB6A5F&index=3)

| Source          | Condition        | Aim              |
|-----------------|------------------|------------------|
| Infeed conveyor | Unmachined part  | Machine OP10.1   |
|                 | Rework           |                  |
|                 | Unknown part     | SPC station      |
| Maschine OP10   | Finished part OK | Outfeed conveyor |
|                 | Test part        | SPC station      |
|                 | Reject           |                  |

Origindestination analysis

### Origindestination analysis

Interrelated processes can be split up into small, individual steps using an origin-destination analysis within the automation control system. Complex tasks are thus mapped in a structured manner.



Interface specification

### Standardized interface

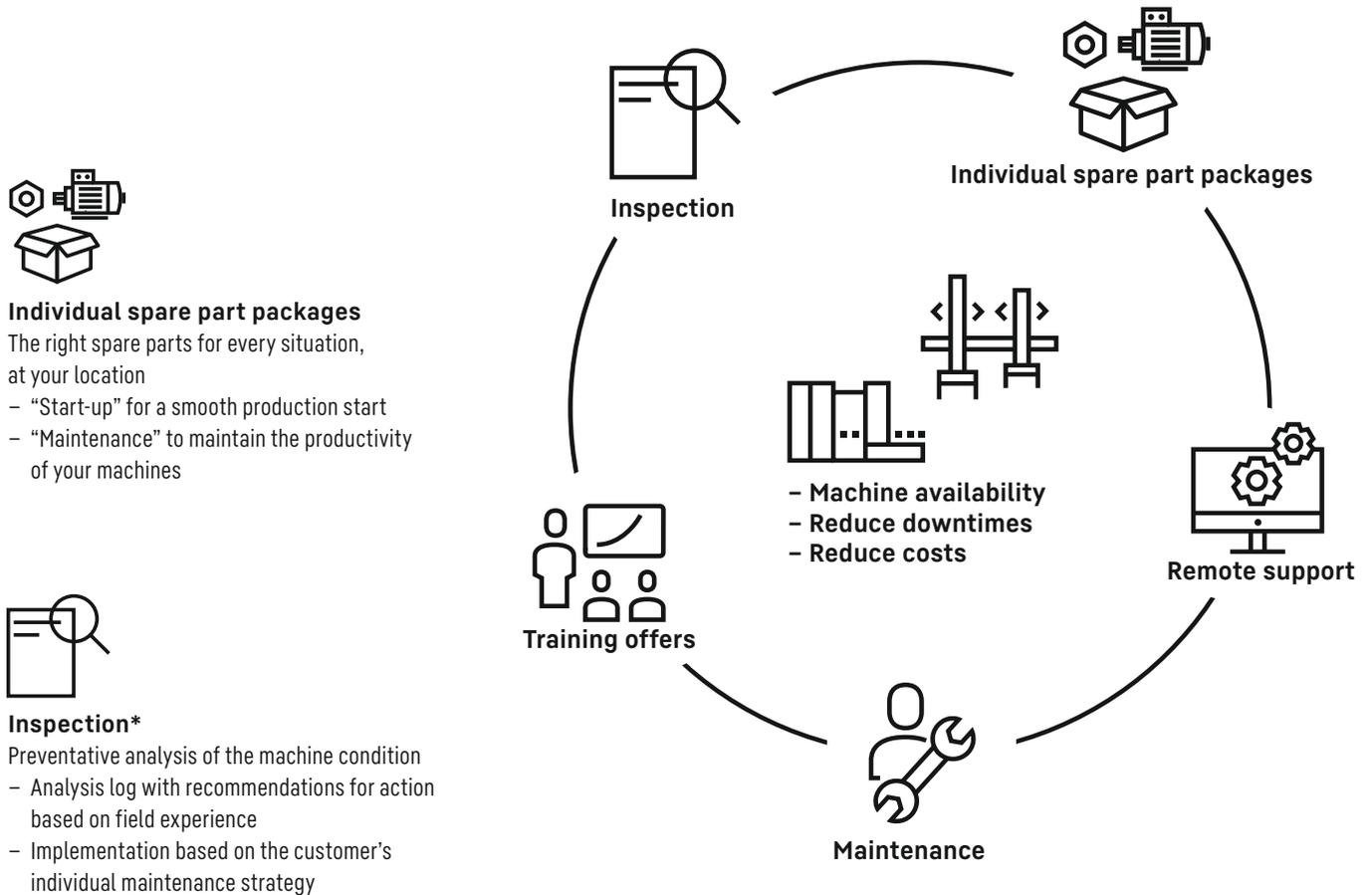
A wide variety of processing machines and control or production planning systems can be integrated using a standardized software interface. This interface helps to ensure short commissioning times and smooth operation, as well as easy maintenance of the system throughout the entire life cycle of the product.

# **Service over the entire life cycle**



## Worldwide presence and spare parts availability

With our main location in Kempten, Germany and global offices and service points, we guarantee a very fast response time which enables 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.



**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

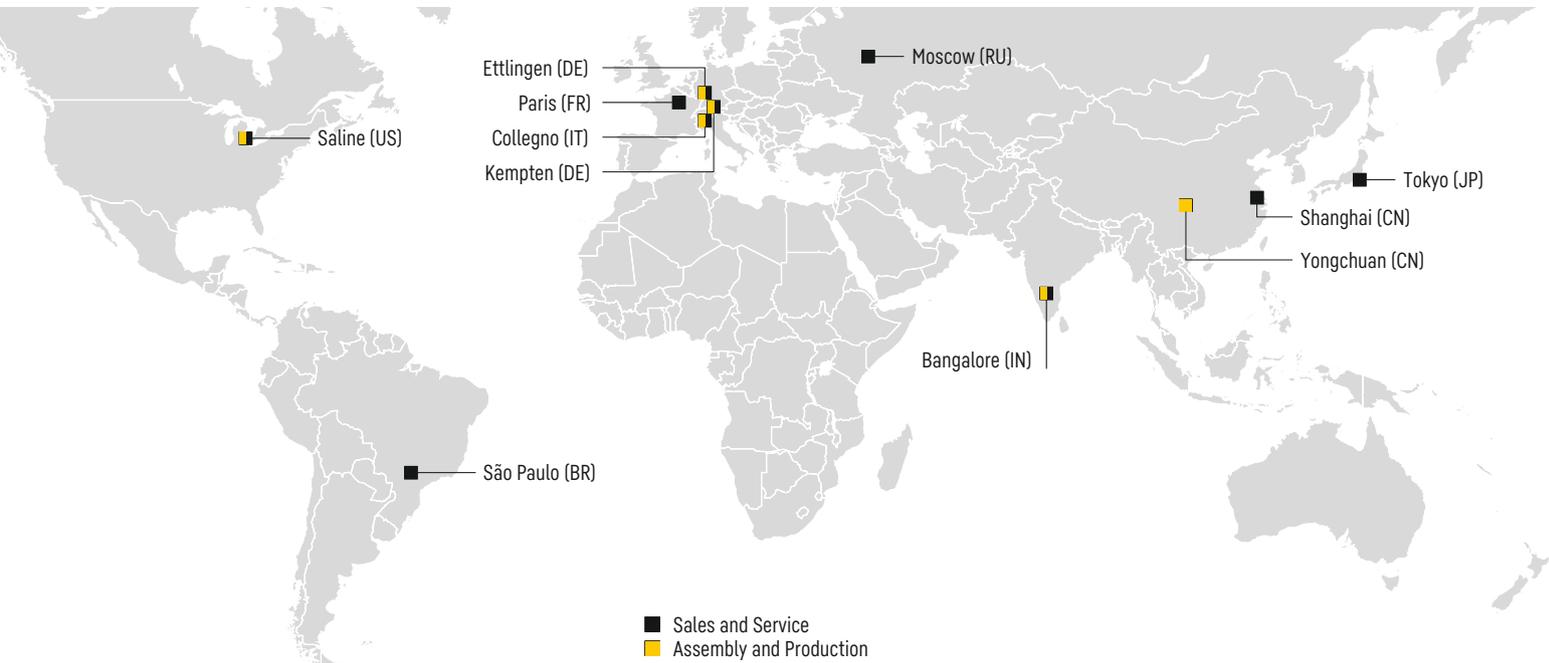
- Function tests and troubleshooting
- Rectification of software problems by remote maintenance
- Support for mechanical challenges provided by Liebherr experts

**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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