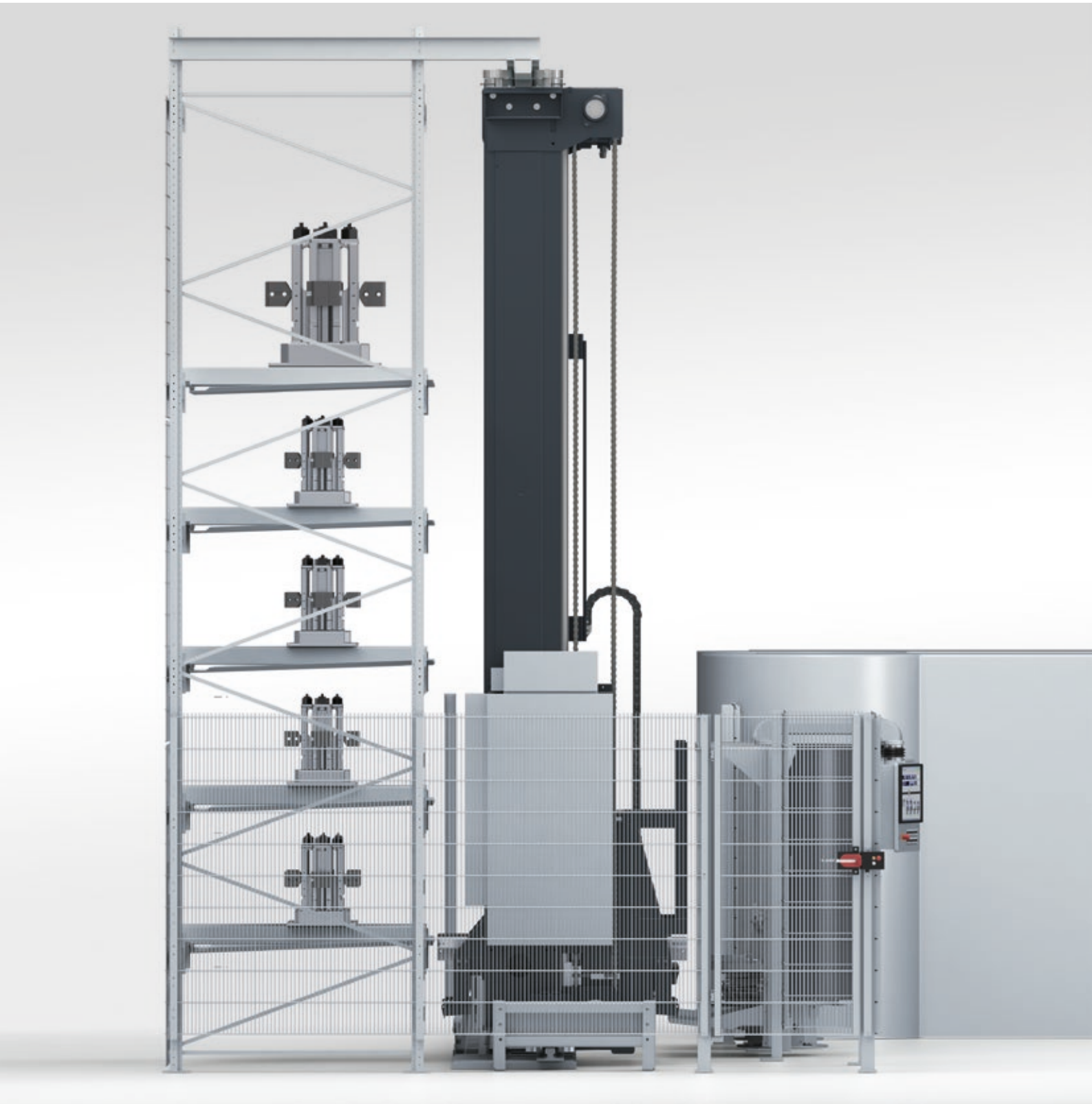
Pallet Handling System (PHS)

LIEBHERR

The Liebherr Pallet Handling System (PHS)



Liebherr offers a wide range of automation systems that support modern high-efficiency production. The emphasis here is on economy, ease of use, quality and reliability in combination with a high degree of flexibility. The production range comprises gantry robots, conveying systems, storage systems, pallet handling systems and robot integration.

Using the modularly designed linear pallet handling system (PHS), Liebherr offers the ideal system solution to flexibly automate machining centers. The system is based on standardized machine pallets on which the workpieces to be machined are clamped manually or automatically.

The PHS is available in four sizes for transport loads of 500 to 13,000 kg. The modular design allows the system to be individually adapted to each application case. The number of machines, set-up stations and storage slots connected is therefore variable. All requirements of a modern production plant can be met thanks to the possibility of extending the system using blank and finished-part management on pallets. In addition to the four standard sizes, Liebherr also designs special solutions for specific tasks, such as intermediate storage for refrigerator cabinets, for example.

Economy
An essential prerequisite for economical production is the optimum supply of the processing machine. Hand-loaded or semi-automatic machines only meet this requirement to a limited extent. The machining center is optimally supplied with workpieces as a result of setting up the workpieces outside the machine in parallel and also buffering different machining times using temporary storage. The system is therefore ideally suited to production with small lot sizes up to lot size 1. The Liebherr pallet handling system (PHS) can be used to achieve machine utilization rates greater than 90 %. Personnel requirements are also reduced with the implementation of shifts comprising few or no workers, which allows the investment to pay for itself within a short time.

Flexibility
With its modular design, the Liebherr pallet handling systems are particularly flexible and versatile. The individual functional modules can be combined with one another freely. This means that the optimal solution can be found for any task.

Ease of Use
An optimal working environment is the basis for a smooth manufacturing process.
Ergonomic workplaces, easy operation and an intelligent, graphics-based cell control system all simplify the system handling. This results in a high degree of acceptance, short commissioning times and quick production start-up.

Quality and Reliability
Quality is the ultimate priority at Liebherr. Every production stage is consistently monitored in order to achieve optimum results at all times and to ensure the reliability and long life of the products.
The quality management system of the overall production process at Liebherr-Verzahntechnik GmbH is certified in accordance with DIN EN ISO 9001:2008. Moreover, many years of experience and state-of-the-art technologies flow into product development.

Flexibility

Lift Module

Shelf Module

Flexibility is an important factor in the decision for investing in a new production system. Special standards are required when selecting a pallet handling system.

Requirements such as step-by-step development, sustainable expansion possibilities, an individually adjustable cell control system and integration of additional equipment such as washing, measuring and deburring are all at the forefront. Integrating the material supply in the system and supporting the logistics environment are also becoming ever more important.

Safety Equipment

Set-Up Module

Modular System
Four sizes cover a wide range of applications. Within each size, there are different payloads available to make precise adjustments for each application case. The modular system comprises the following basic components:

- Lift module
- Shelf module
- Safety equipment
- Set-up module
- Front access (optional)

Depending on the requirements and customer needs, these elements are configured into one complete system.
All base modules of a similar size can be individually configured. For example:

- Machine and material-pallet handling
- Different machine types and sizes
- Different set-up stations

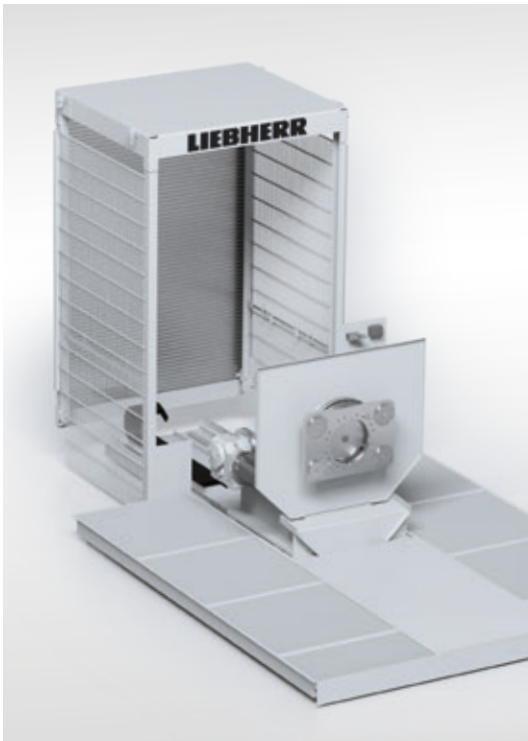
To use the available space as best as possible, the shelf division and the size of the storage slots in the shelf are adapted to the existing pallet and workpiece sizes.

Different shelf divisions, single- or double-sided shelf, machine and variable set-up station arrangements are designed in accordance with customer requirements or existing framework conditions.

Set-Up Stations

Standard

Mobile



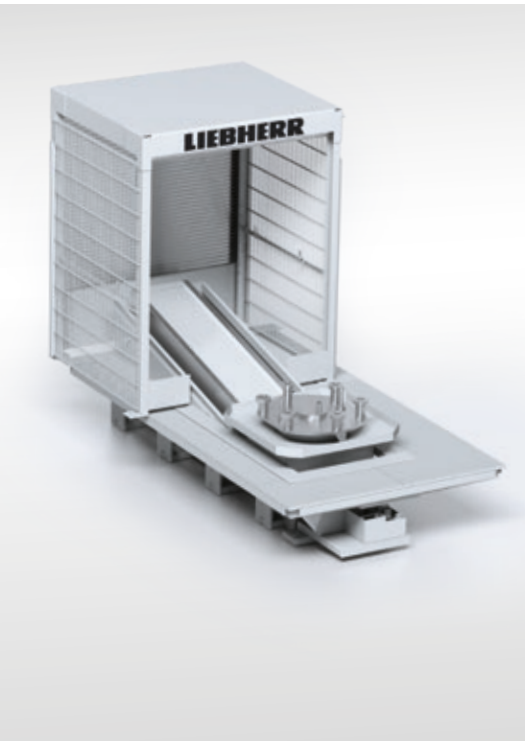
Mobile, Rotating, Tiltable

The set-up station is the link between the operator and the handling system. Here, the workpieces are clamped on the machine pallets manually or automatically. In doing so, ergonomics and ease of use are prioritized. In order to meet the different requirements, Liebherr offers numerous set-up station variants. All set-up station variants are also available with electrically driven rotary axes and a hydraulic connection. Every set-up station is equipped with a decentralized control system. This allows retrofitting to be carried out without any problems and to complete commissioning without having to intervene in the transport-vehicle control system.

Standard
The Liebherr standard set-up station stands out thanks to its robust design and access doors that are operated with just one hand. It is suitable for workpiece diameters of up to 1700 mm. An integrated container with sump pump collects cooling lubricants and chips that accumulate.

Mobile
The Liebherr set-up station with horizontal movement axis is the alternative option if it is necessary to integrate it into the storage shelf or to provide optimum accessibility. It is available for all appliance sizes and workpiece diameters. Safety is ensured by an electrically driven roller shutter. An integrated container with sump pump collects cooling lubricants and chips that accumulate.

Mobile, Rotating, Tiltable
Liebherr offers set-up stations with mobile, rotating or tillable devices for special applications. Permissible payloads and workpiece diameters depend on the relevant combination.



Inclined Hoist

Precision Set-Up Station

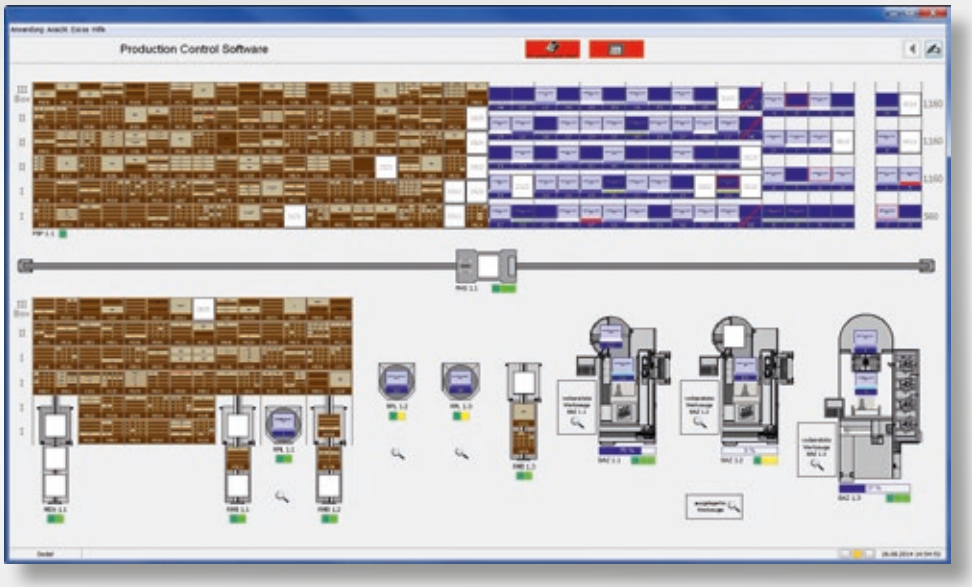
Set-Up Station for Material Pallet

Inclined Hoist
Accessing high workpieces can be made significantly easier by using a set-up station with an inclined hoist. Here, the pallet is lowered until just above the hall floor. As with the mobile set-up station, safety is ensured by an electrically driven roller shutter. An integrated container with sump pump collects cooling lubricants and chips that accumulate. It is available for all appliance sizes up to 6500 kg and the corresponding workpiece diameters.

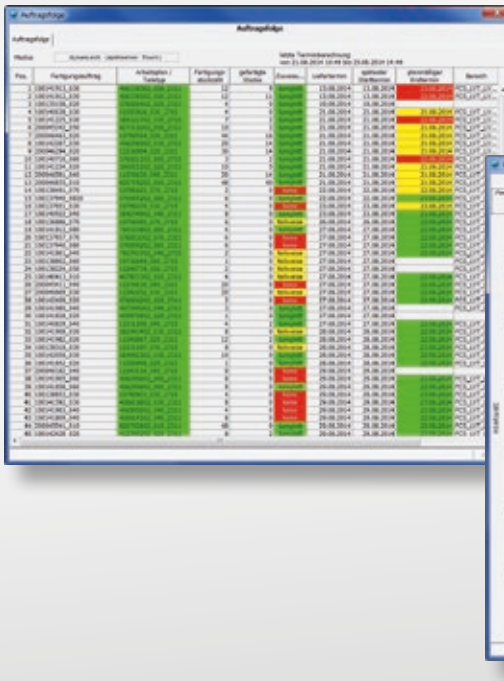
Precision Set-Up Station
The rotational processing of workpieces clamped on pallets (e.g. turning, hobbing) requires a high level of part concentricity. To set this concentricity in a reproducible manner, Liebherr has included a precision set-up station in its portfolio.

Set-Up Station for Material Pallet
If blank or finished-part management is integrated in the pallet handling system, material pallets must be imported into and exported from the system. Depending on the type of material pallet, conveyor systems in different designs and with different lengths are available for this. As with the set-up stations for machine pallets, safety is ensured by an electrically driven roller shutter.

Ease of Use



Cell Control



Order Planning

The key link between the operator, the connected machine, equipment and automation is the cell control system. It coordinates all necessary tasks for planning orders and resources. An important factor in the acceptance of a system by users is ease of operation. A user-friendly concept aids handling of the pallet handling system in production mode, which in turn heightens acceptance. All necessary activities are combined at one point and are made available to the operator in advance. The real-time graphical display of the complete production cell, the detailed information on the monitor and triggering functions by using the mouse via drag and drop simplify the operation.

Resource Planning

Individual Adjustment and Standardized Data Exchange

Order Planning
The basic design supports the entire order planning process. Orders are planned by determining the machining sequence of the workpieces. Depending on the requirements, the system can also manage the completion dates, which are used as the basis for dynamically generating the sequence. This function is based on a patented planning process.

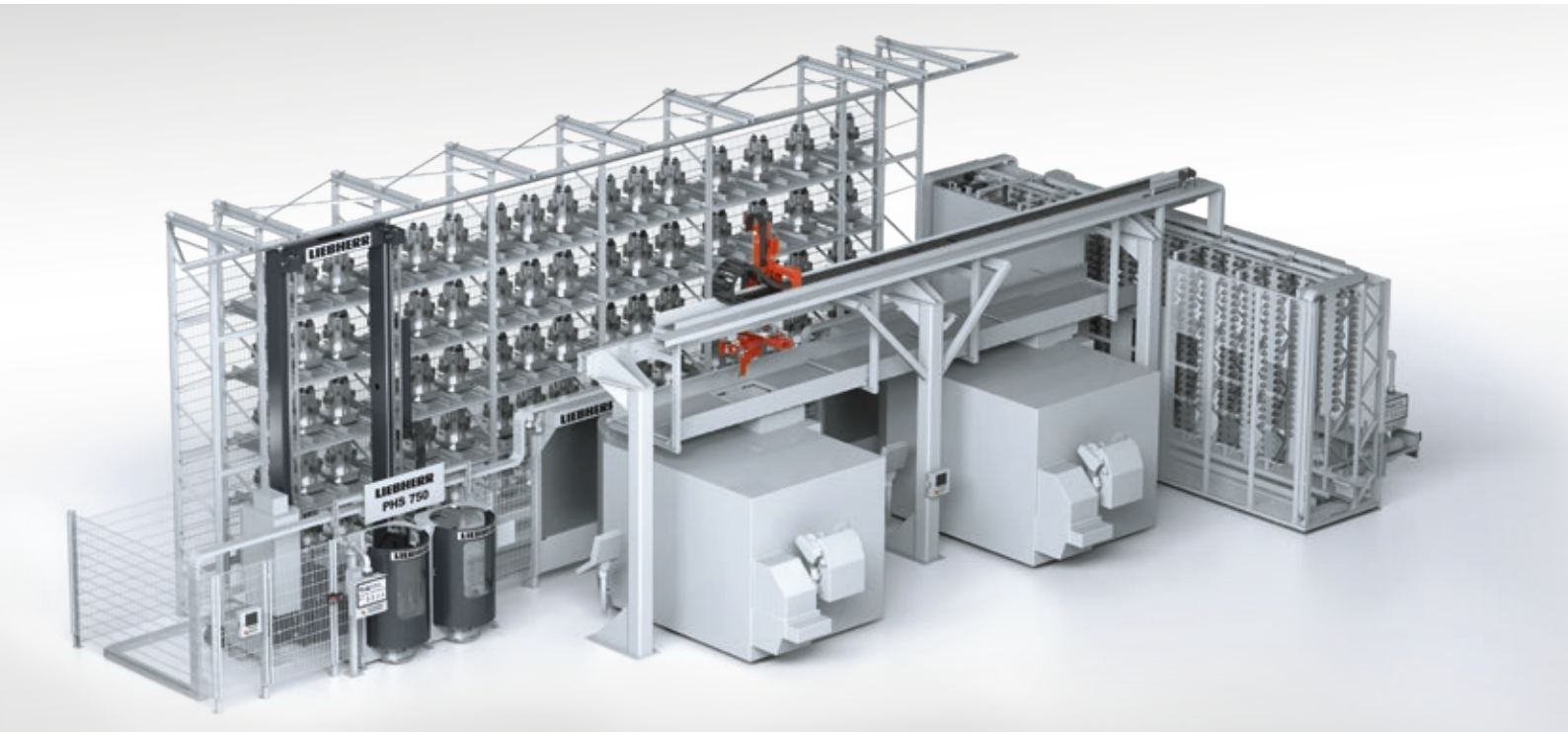
Resource Planning
Resource planning (available as an option) using predictive simulation by calculating the resource requirements also ensures that production cells are supplied with tools, NC programs and materials at the right time. Downtimes caused by supply bottlenecks are therefore eliminated in advance and machine utilization is significantly increased.

The proven traffic-light signaling system makes it easier to evaluate the overall situation at a glance.

Expansion Possibilities
The basic system can be expanded with more than 90 functional modules and allows the system to be individually adapted to each requirement. Tested interfaces simplify standardized data exchange with organization systems and device control systems. Thanks to the modular design, additional modules such as operating data recording or ERP systems integration can be included at a later point without creating problems.

Transparent Processes
Continually improving productivity is the aim of every production plant. Here, the cell control system makes various tools available, such as system utilization in accordance with VDI 3423, the part-cycle documentation and the part output.

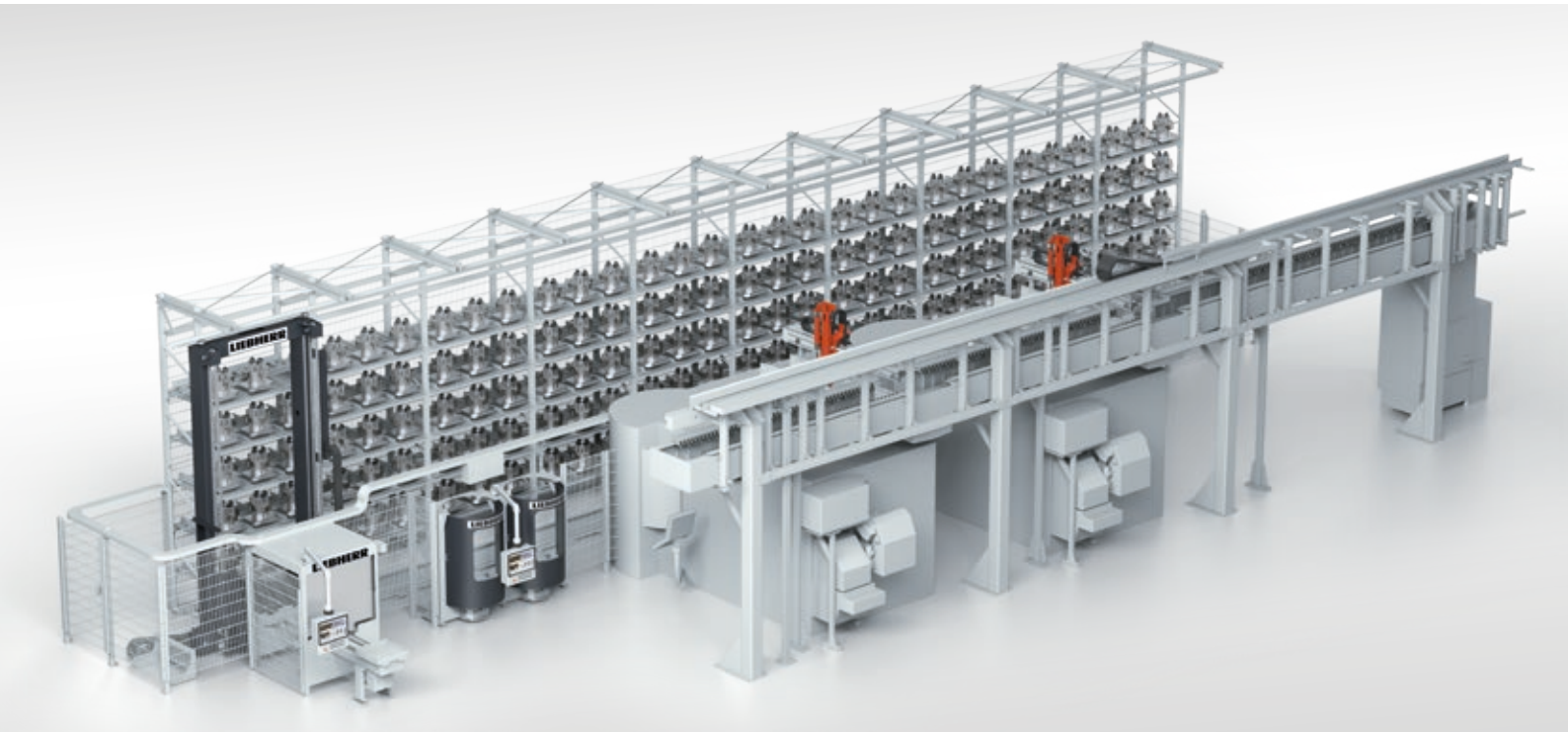
Tool Handling Systems



Central Magazine

A comprehensive parts spectrum requires numerous different tools, depending on the machining task. These are generally stored in the machine's tool magazine. However, depending on the machine design, the number of tools to be stored is limited. To avoid having to set up tools regularly and to ensure unmanned production over longer periods of time; Liebherr offers autonomous tool storage and tool handling systems. They store up to 2000 tools and supply them to the machine. Particularly for systems with several machines and requirements for special and duplicate tools, they can be stored centrally and divided among the relevant machines. As a result, tool investment is significantly reduced. Tool management is provided by the cell control system and ensures a continuous flow of information. All information required for controlling the complete system is therefore combined at one point and is centrally available to the operator.

Liebherr tool handling systems have a modular design and can be individually adapted to any requirement and different tool holders (HSK, SK, etc.). They consist of a tool storage system and the appropriate distribution system. The Liebherr tool storage systems are available in two designs: As a central magazine or as an overhead magazine.

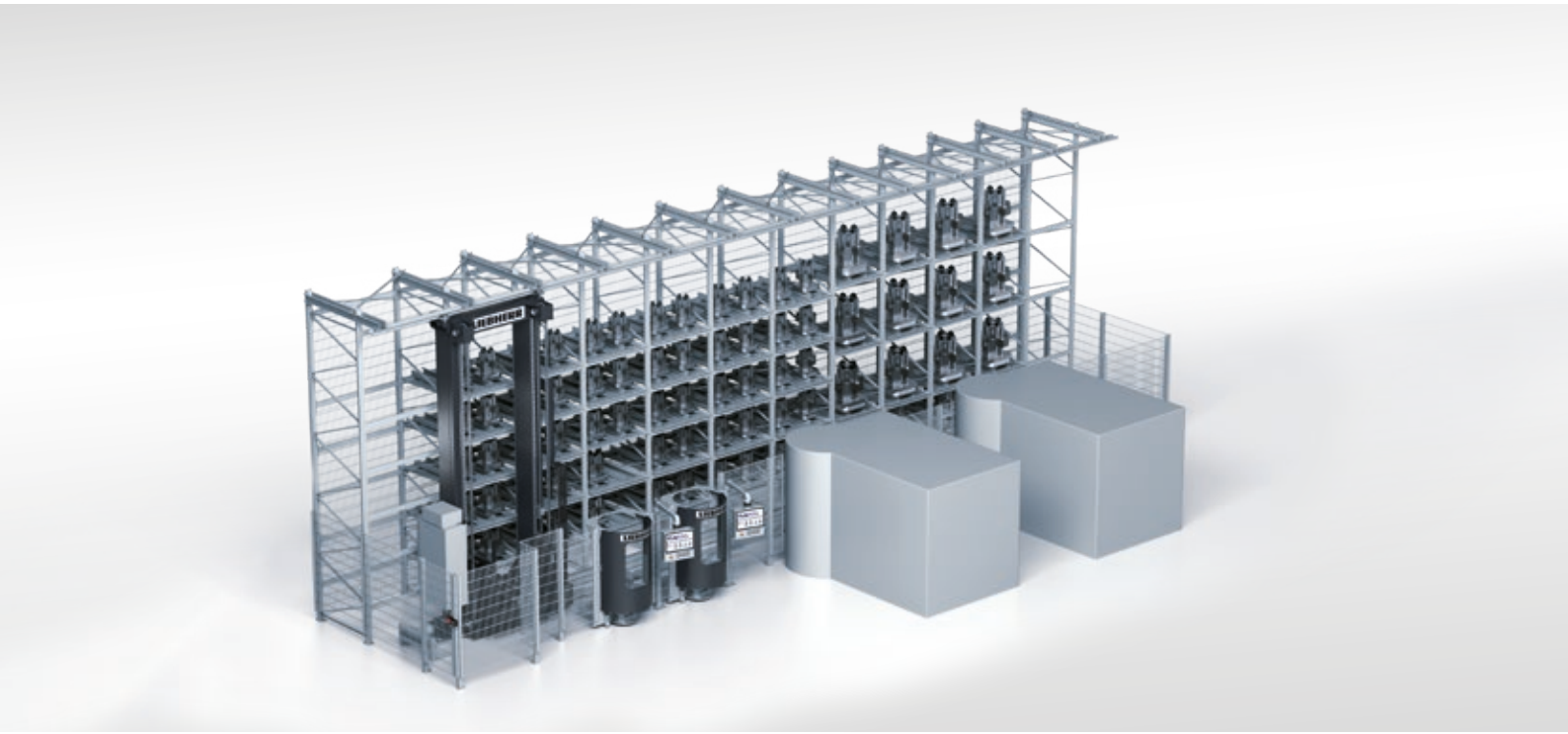


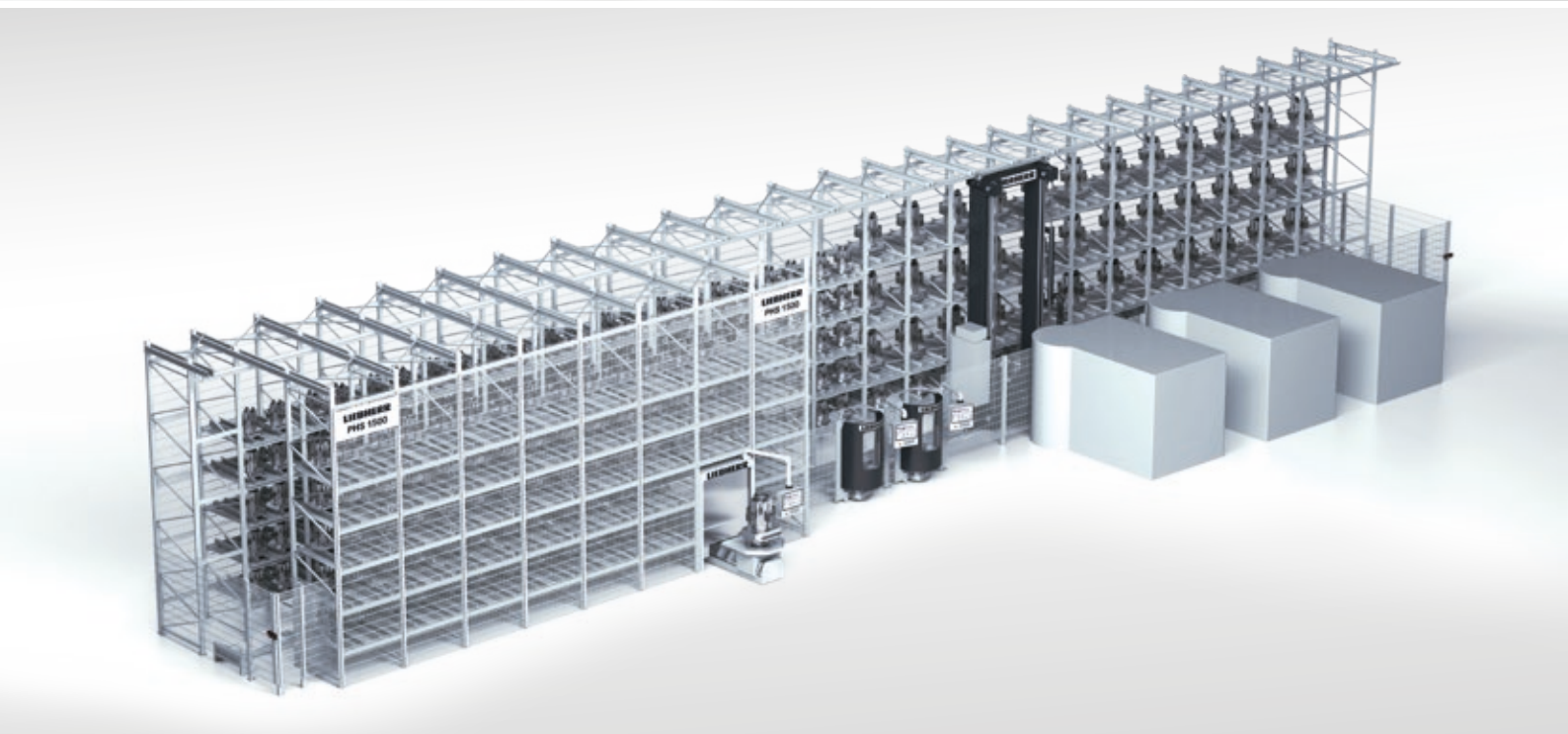
Overhead Magazine

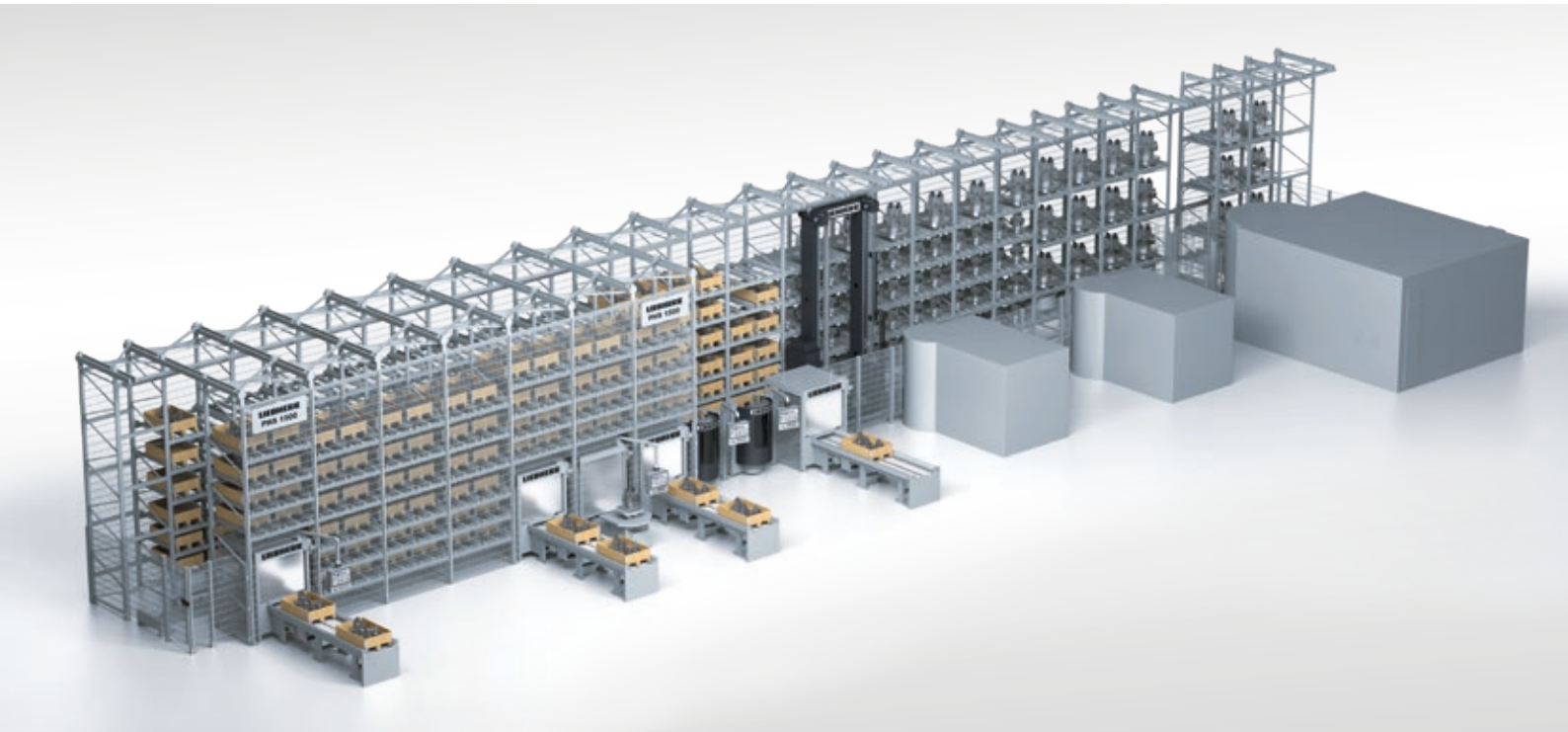
Central Magazine
On the central-magazine design, the tools are stored in a separate magazine module and supplied to the machine using a distribution system. Tools are transferred into and out via a drawer in the magazine module. There, the tools are identified and the information from the cell control system is made available for further processing. The magazine module is available with a single- or double-sided storage shelf arrangement and in different lengths. It can therefore be individually adapted to the relevant surface and capacity requirements. Depending on the tool size, storage capacities of up to 2000 tools are available.

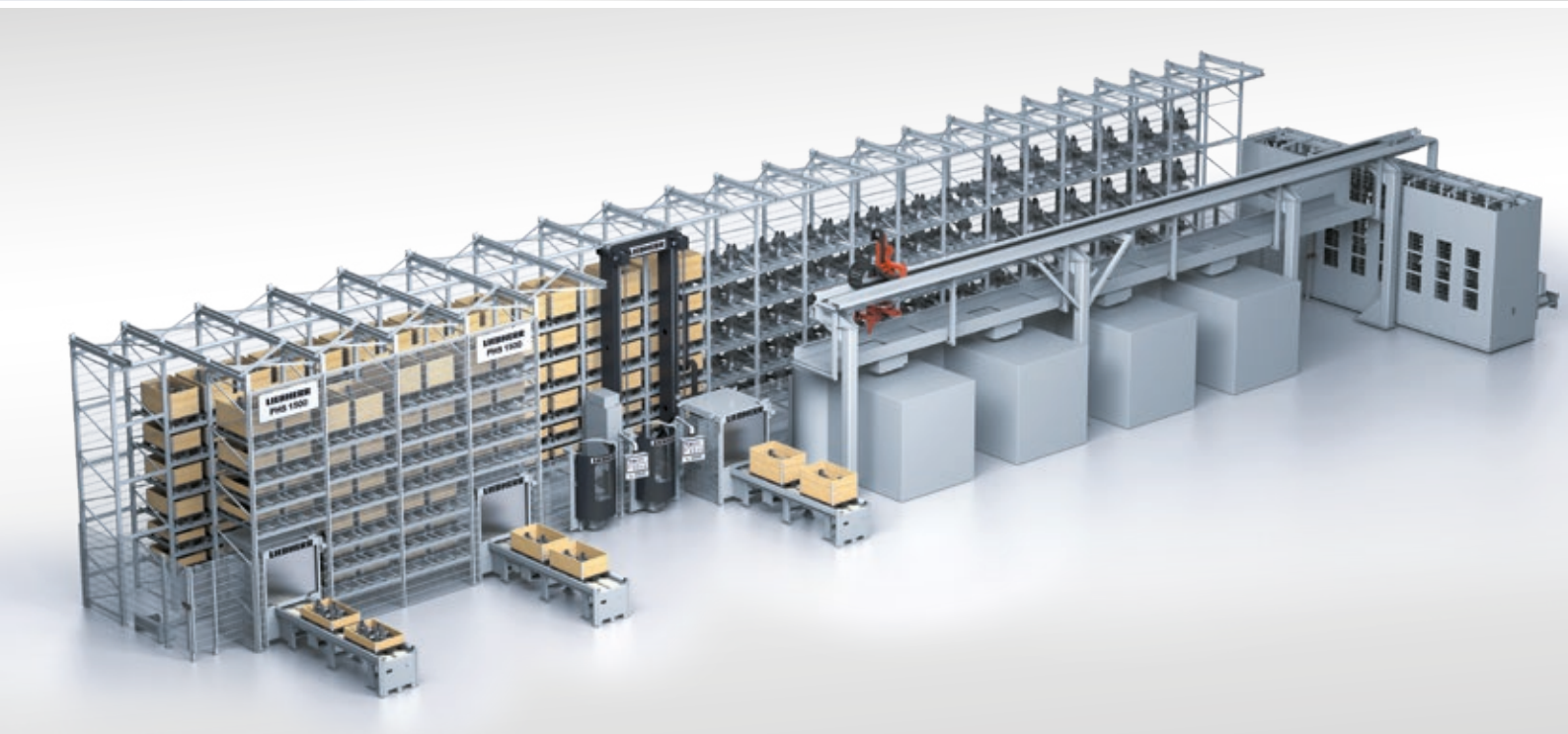
Overhead Magazine
On the overhead-magazine design, the operator protection on the distribution system is also used for tool storage. The distributor system stores the tools in tool holders mounted on both sides. Tools are supplied to the system using a separate delivery station. There, the tools are identified and the information from the cell control system is made available for further processing. The storage capacity depends on the length of the distribution system. Depending on the tool size, 10 to 20 tools can be stored per meter.

Examples and Different Layouts





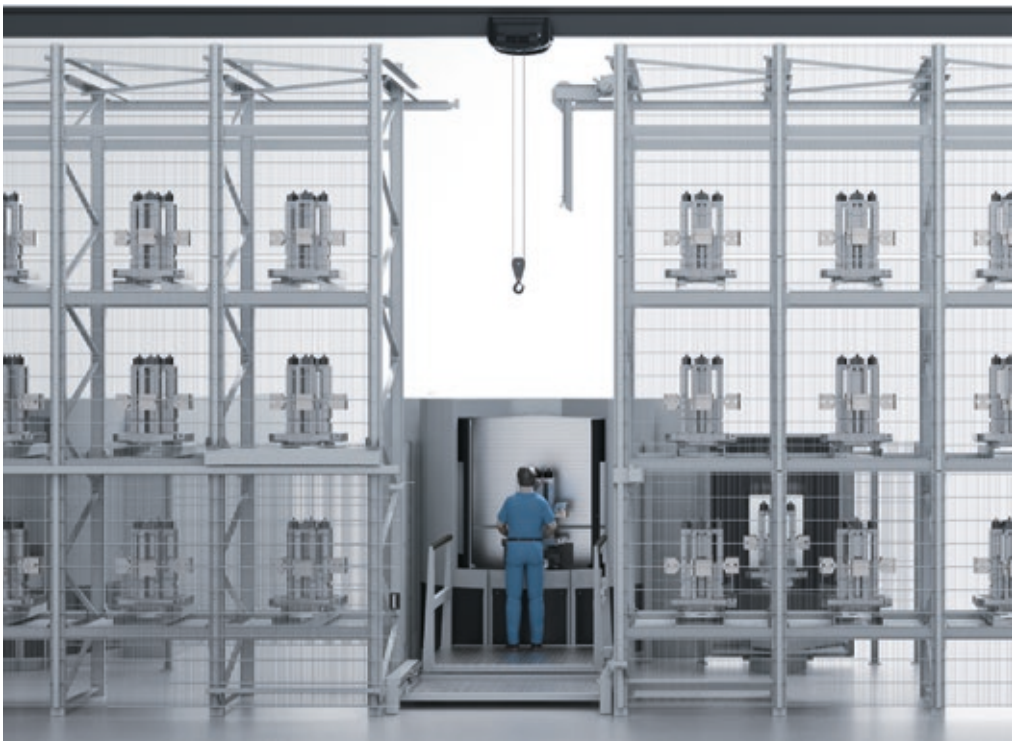




Flexibility

Using the patented front access, operating personnel can access the machining center in the event of manual maintenance or testing work, or can use the machine in workshop operation. This access also allows the system to be loaded manually or using an overhead crane if parts are heavy. Other machines that are connected to the system can continue to be operated in automatic mode in parallel.

The front access consists of a retractable access platform with a sliding door and a movable, electric-motor roof rail. Depending on the application, these components are also available separately.



Service and Maintenance

Liebherr Service has its headquarters in Kempten (Germany), and has a network of Liebherr support centers around the world. The experts who man the customer hotline provides professional help should this need be required. Included in the services offered are the provisions of spare parts, inspections, maintenance or modifications to systems. Since the products have an universal modular design, rapid provision of spare parts is assured, which means that downtimes are kept to a minimum.

The Liebherr pallet handling system was designed to be maintenance-friendly throughout. The necessary lubricating points are supplied automatically. As with all pneumatic components and bus models, these points are easily accessible. Every pallet handling system is supplied with a detailed operating manual and service handbook that specifies the service intervals and describes the work that needs to be performed.

As an option, Liebherr also offers the means of remote maintenance. In this instance, Liebherr experts run fault diagnostics online.

Thanks to the use of commercially available components, such as drive and control systems, Liebherr guarantees a high level of availability for the whole system.

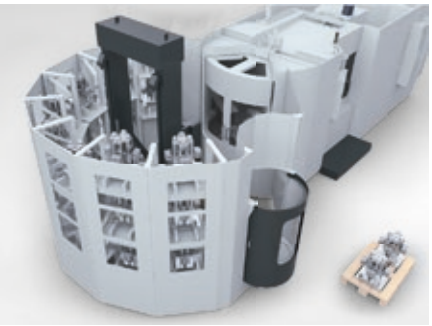
Model	Workpiece Diameter (mm)	Transport Load (kg)
PHS 750	1,000	500 / 700 / 1,000
PHS 1500	1,150 / 1,700	1,500 / 2,000 / 2,500
PHS 3500	1,900 / 2,400	3,500 / 5,000 / 6,500
PHS 10000	3,000 / 3,500 / < on request	10,000 / 13,000 / < on request

Liebherr Rotary System RLS – Is a cost-effective alternative for modern and high-efficiency production.
For more details, see:
www.liebherr.com/AS

Machine Tools and Automation Systems from Liebherr

Liebherr employs roughly 1200 staff in the area of machine tools and automation technology and has production facilities in Kempten and Ettlingen (Germany), Collegno (Italy), Saline (Michigan, USA) and Bangalore (India). They are supported by expert and reliable marketing and service specialists at a large number of locations worldwide.

With over sixty years of industrial experience, Liebherr is one of the world's leading manufacturers of CNC gear cutting machines, gear cutting tools and automation systems. The company's innovative products are the result of pioneering ideas, highly qualified staff and state-of-the-art manufacturing systems at each of their locations. They are characterised by economy, ease of use, quality and reliability in combination with a high degree of flexibility.



System Solutions in the Area of Machine Tools
Included in the production programme are gear hobbing machines, gear shaping machines and generating- and profile grinding-machines, all noted for their high degree of stability and availability. Particular importance is attached to the energy efficiency of the machines.
Gear cutting machines from Liebherr are supplied to renowned manufacturers of gears and gearboxes and large-scale slewing rings worldwide. They are in demand primarily from the automotive and construction machinery industries and also increasingly from the wind power industry for the manufacture of gears for wind turbines.

High Quality Gear Cutting Tools
Liebherr manufactures high quality, precision tools for the soft and hard machining of gears and all Liebherr gear cutting machines are fitted with Liebherr tools. The range also includes Lorenz shaping tools and products customised for specific customer applications.

Automation Systems for a Broad Range of Applications
Liebherr has a wide range of products for linear robots, pallet-handling systems, conveying systems and robot integration for projects in all areas of production and can provide above-average availability of systems.

www.liebherr.com

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