
GearUp! LineUp!

**Gear technology, measuring
technology and automation
systems**

LIEBHERR

Liebherr-Verzahntechnik GmbH



Liebherr-Verzahntechnik GmbH



Kempten, Germany

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

Thanks to the high level of in-house vertical integration, the majority of mechanical production, sheet metal forming, paintwork, and component assembly takes place directly at the Kempten site.



Ettlingen, Germany



Collegno, Italy



Saline, USA



Bangalore, India



Yongchuan, China

**Sales per business unit of
Liebherr-Verzahntechnik GmbH**



- Gearing technology machines
- Automation systems
- Gearing cutting tools

**Sales according to industry of
Liebherr-Verzahntechnik GmbH**



- Automotive
- Automotive suppliers
- Truck
- Agricultural and construction machines
- Aerospace
- General mechanical engineering
- Other

Program



Gear cutting machines

- Gear generating and profile grinding machines
- Gear hobbing machines
- Gear shaping machines
- Gear skiving machines
- Deburring and chamfering machines
- Chamfering and additional operations

Measuring technology

- Gear measuring instruments

Gear tools

- Shaping cutters
- Wafer cutters
- Master gear
- CBN grinding tools
- Customized grinding tools
- Skiving tools
- Rolling racks

Automation systems

- Plant and system solutions for the machining industry
- Gantry robots
- Conveying and storage systems
- E-mobility: automated dismantling of high-voltage batteries
- Pallet handling systems
- Robot applications
- Software

Service

- Liebherr Academy
- Preventive maintenance
- Global presence and spare parts availability

Gear generating and profile grinding machines



The LGG/LCS series from Liebherr is an optimal machine concept for the hard-fine machining of gears and spline shafts. The gear grinding machines are suitable for workpieces up to a diameter of 1,200 mm, plus they are versatile and extremely productive.

Liebherr machines for grinding gears can be individually configured for every customer.

Gear generating- and profile-grinding machines

Type	Module (mm)	Workpiece-Ø (mm)	Axial distance (mm)
LGG 180	5 / 6	180	660
LGG 280	5 / 6	280	660
LGG 300	14 / 14	300	1,000
LGG 380	14 / 14	380	1,000
LGG 400 M	5 / 6	400	660
LGG 500	14 / 14	500	1,000
LGG 700 M	14 / 14	700	1,000
LCS 800	14 / 20	800	1,450
LCS 1000	14 / 20	1,000	1,450
LCS 1200	14 / 20	1,200	1,450

Larger types on request M = Manual loading



Video:
LGG 280
<https://go.liebherr.com/6x47kg>

Gear hobbing machines



For machining workpieces with a pitch diameter of max. 12 metres, Liebherr offers a choice of gear hobbing machines with individual concepts for machine automation.

Workpiece up to Ø 700 mm

Type	Module (mm)	Workpiece-Ø (mm)	Axial distance (mm)
LC 180	4/6	180	400
LC 180 DC	4/6	180	400
LC 280 α	6	280	400
LC 280	4/6	280	400
LC 280 DC	4/6	280	400
LC 300	12	300	700
LC 300 DC	12	300	700
LC 400 M	8	400	400
LC 500	12	500	700
LC 500 DC	12	500	700
LC 700 M	12	700	700



Video:
LC 280 α
<https://go.liebherr.com/rVg4ZY>



Video:
LC 180 ChamferCut
<https://go.liebherr.com/d4d728>



Workpiece up to Ø 2,000 mm

Type	Module (mm)	Workpiece-Ø (mm)	Axial distance (mm)
LC 600	16/22/27	600	1,000/1,400
LC 700	16/22/27	700	1,000/1,400
LC 800	16/22/27	800	1,000/1,400
LC 1000	16/22/27	1,000	1,000/1,400
LC 1200	16/22/27	1,200	1,000/1,400
LC 1400	16/22/27	1,400	1,000/1,400
LC 1600	16/22/27	1,600	1,000/1,400
LC 2000	16/22/27	2,000	1,200/1,400

Workpiece up to Ø 12,000 mm

Type	Module (mm)	Workpiece-Ø (mm)	Axial distance (mm)
LC 1500	24 (30)	1,500	1,200/2,400
LC 2000	24 (30)	2,000	1,200/2,400
LC 2500	30 (40)	2,500	1,200/2,400
LC 3000	30 (40)	3,000	1,200/2,400
LC 4500	30 (40)	4,500	1,200/2,400
LC 6000	30 (40)	6,000	1,200/2,400
LC 8000	50 (60)	8,000	1,200/2,400
LC 10000	50 (60)	10,000	1,200/2,400
LC 12000	50 (60)	12,000	1,200/2,400

() Gashing



Video:
LC 4000
<https://go.liebherr.com/Qa78gy>

Gear shaping machines



Workpiece up to Ø 700 mm

Type	Module (mm)	Workpiece-Ø (mm)	Stroke length (mm)	Axial distance (mm)
LS 80 (DC)	3/5	80	30/55	-
LS 80 F (DC)	3/5	80	70	275
LS 180 (DC)	3/5	180	30/55	-
LS 180 E (DC)	5	180	70	275
LS 280 (DC)	3/5	280	30/55	-
LS 280 F/E (DC)	5	280	70	275
LS 300 E (DC)	5/12	300	70/120/240	435/650/300
LS 400 EM (DC)	5	400	70	275
LS 500 E (DC)	5/12	500	70/120/240	435/650/300
LS 700 EM	8/12	700	120/240	750

Gear shaping machines are employed primarily in the production of internal and external gears on workpieces with limited tool overrun. That means that the special workpiece geometry or interference conditions only make machining possible using the shaping process. Gear shaping machines are equipped with cutting tools from our own production which are optimally matched to the process and the machine.



Video:
LS 500 E
<https://go.liebherr.com/kgn4l9>



Workpieces up to Ø 2,000 mm

Type	Module (mm)	Workpiece-Ø (mm)	Stroke length (mm)	Axial distance (mm)
LS 600 E	8 / 12	600	120 / 240	950
LS 700 E	8 / 12	700	120 / 240	950
LS 800 E	8 / 12	800	120 / 240	950
LS 800 H	22	800	270 / 440	1,400
LS 1000 E	8 / 12	1,000	120 / 240	950
LS 1000 H	22	1,000	270 / 440	1,400
LS 1200 E	8 / 12	1,200	120 / 240	950
LS 1200 H	22	1,200	270 / 440	1,400
LS 1400 E	8 / 12	1,400	120 / 240	950
LS 1400 H	22	1,400	270 / 440	1,400
LS 1600 H	22	1,600	270 / 440	1,400
LS 2000 H	22	2,000	270 / 440	1,400

Workpiece up to Ø 4,500 mm

Type	Module (mm)	Workpiece-Ø (mm)	Stroke length (mm)	Axial distance (mm)
LS 1500 H	22	1,500	440 / 600	1,800
LS 2000 H	22	2,000	440 / 600	1,800
LS 2500 H	22	2,500	440 / 600	1,800
LS 3000 H	22	3,000	440 / 600	1,800
LS 4500 H	22	4,500	440 / 600	1,800

E = Shaping head slide with electronic shaping head

H = Shaping head slide with hydraulic shaping head

EM = Shaping head slide with electronic shaping head and manual loading

Skiving machines



In the gear skiving machines, the process, tools and machine and automation system, come from a single source, since skiving³ is primarily about delivering a complete solution for the customer. The process provides high quality assurance and productivity when machining internal and external gears. Skiving³ is especially suited for internal gears of medium size and quantity, as it is much faster than shaping and more economical than broaching.

Skiving³

Machine:

automation, deburring and rigidity

Tool:

design, machining, processing

Process:

technology configuration, implementation, optimization

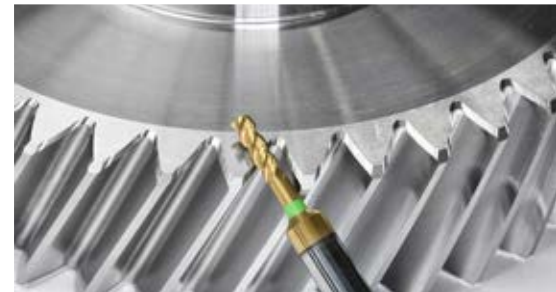
Skiving machines

Type	Module (mm)	Max. outer-Ø (mm)	Tooth-Ø (mm)
LK 180 (DC)	3	180	180
LK 280 (DC)	3	280	280
LK 300 (DC)	6.5	500	300
LK 500 (DC)	6.5	600	500



Video:
LK 280 DC
<https://go.liebherr.com/1b2m7r>

Deburring and chamfering machines



This method, established for many years and well-known for its very high chamfer quality, is combined with proven machine technology. The chamfering operation is now available as a stand-alone machine. The Chamfercut tools, which can be easily re-sharpened multiple times, create precise chamfers with high consistency, a long tool life and facilitate optimum economy. ChamferCut and FlexChamfer complement each other perfectly as processes for the precise chamfering of gears. ChamferCut is particularly suitable for mass production, as it can produce large quantities with precise chamfering in a short time. FlexChamfer, on the other hand, is ideal for machining small batch sizes and difficult component geometries. The two processes can be combined on one machine, so there is no need to compromise. The combination allows a flexible response to different orders – for efficient production and top quality.

Deburring and chamfering machines

Type	Module (mm)	Tooth-Ø (mm)
LD 180 C	5	180
LD 280 C	5	280



Video:
LD 180/280 C
<https://go.liebherr.com/3h978r>

Chamfering during the machining process and other additional operations



ChamferCut

Precise – reliable – cost-effective. With the ChamferCut tools, gears are chamfered in a continual process. Chamfering with ChamferCut combines short process times with a very long tool life, which results in not only very low component costs but also a considerable advantage for downstream finish machining processes.

ChamferCut CG (Collision Gear) for components with interfering contours

With the new ChamferCut CG, it is now possible to chamfer gears with interfering contours with a previously unattainable efficiency. This process is ideally suited to customer component parts with medium to high batch sizes and very low cycle times. Two individual ChamferCut tools are used for this, which chamfer the edges of a tooth space successively with the usual high quality and process reliability. Up to four ChamferCut tools can be used on one ChamferCut arbor.



ChamferCut IG (Internal Gear) for internal gears

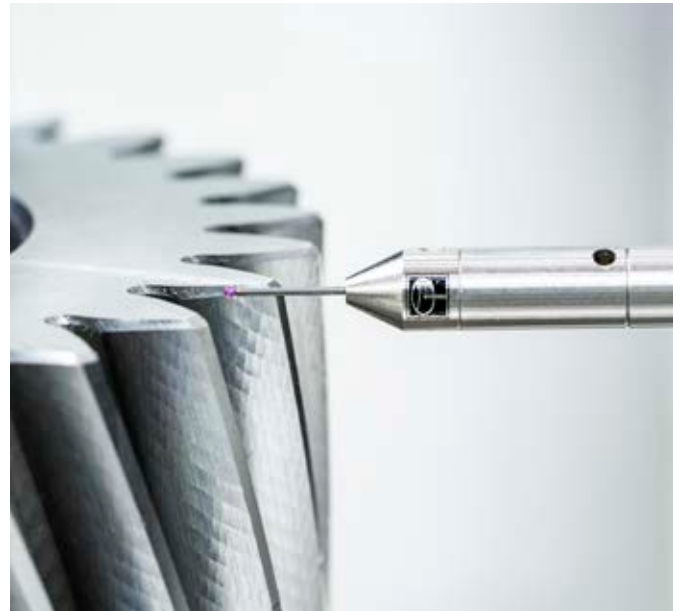
With ChamferCut IG, internal gears can now also be deburred by metal cutting and chamfered. ChamferCut is a very quick and precise method which now offers new, previously unavailable possibilities for internal gears. For certain internal gear geometries, this opens up a new, technically very interesting alternative to conventional chamfering processes.



FlexChamfer – NC chamfering with standard shank cutter

The universal FlexChamfer process combines flexibility with precision for targeted chamfering of internal and external gears. Geometrically simple standard gear cutting tools are used here, which, due to the optimized NC movements, run parallel to machining and therefore optimally in terms of unit costs. The NC movements enable a reproducibly accurate and precise chamfer quality compared to existing chamfering methods using shank cutters. FlexChamfer offers maximum flexibility for every user.

Gear measuring machines



The four-axis measuring machines of the WGT series have high-precision mechanics and electronics, which are controlled by smart and user-friendly software. They meet all accuracy requirements with regard to gear manufacturing and comply with VDI guidelines VDI/VDE 2612 and 2613, group 1, as well as optional acceptance in accordance with ISO 10360 1 and 2. In addition to the gear inspection machine options available as standard, customer-specific solutions are also available, such as extending the travel

range on the Z-axis, and longer tailstocks to accommodate long shafts. An automatic sensor changing system ensures uninterrupted measurement of the workpieces and also offers maximum levels of convenience for the measuring technician. The extensive software features make the machines suitable for measuring all types of cylindrical gears, bevel gears, worms, worm gears, shafts, gear cutting tools, and other rotationally symmetrical parts such as shafts.

Gear measuring machines

		WGT280	WGT400	WGT600	WGT850	WGT1200
Max. workpiece Ø	mm	5-280	5-400	5-600	850 (1,000)	1,200 (1,400)
Min. module	mm	0.5 (0.12)	0.5 (0.12)	0.5 (0.12)	0.5 (0.3)	0.5 (0.3)
Measurable face width	mm	500	500 (650)	650 (800)	1,000 (1,500)	1,000 (1,500)
Distance between centers	mm	50-500	20-650 (900)	20-900 (1,200)	50-1,200 (1,600, 2,000)	50-1,200 (1,600, 2,000)
Max. rotary table load	kg	50	180	400	3,000	3,000 (5,000)
Helix angle	°	<90	<90	<90	<90	<90
Measuring range	mm	X: 340 Y: 200 Z: 500	X: 400 Y: 220 Z: 500 (650)	X: 500 Y: 320 Z: 650 (800)	X: 900 Y: 540 Z: 1,000 (1,500)	X: 950 Y: 700 Z: 1,000 (1,500)
Supply voltage		3 Ph/N/PE 400V ±10% frequency 50 Hz; 1Ph/N/PE 150/230 V ±10% frequency 50/60 Hz				
Power with full expansion		max. 1,500 VA	max. 1,500 VA	max. 1,500 VA	max. 1,600 VA	max. 1,600 VA
Compressed air supply		6-10 bar, pre-cleaned; air quality according to ISO 8573-1 class 4				
Air consumption [standard liters]		42NL/min passive 80NL/min active			180NL/min	
Measurement accuracy		Gear inspection accuracy according to VDI/VDE 2612/2613 Group I				

Gear cutting tools



Liebherr is a reliable partner offering an extensive range of gear cutting tools which are characterised by quality down to the finest detail and by their long service life. Many years of experience and sound technical expertise in the field of gear production are the basis for these innovative products.

Gear cutting tools

Tools	Module range (mm)	Tool-Ø (mm)
Shaping cutters	0.25–30	max. 360
Wafer cutters	0.30–6	max. 220
Solid wafer cutters	0.25–30	max. 360
Master Gear	0.75–20	max. 360
CBN grinding tools	1–6	25–200
Skiving tool	0.25–12	20–200
Rolling racks	0.75–1.5	12"–48"

Services

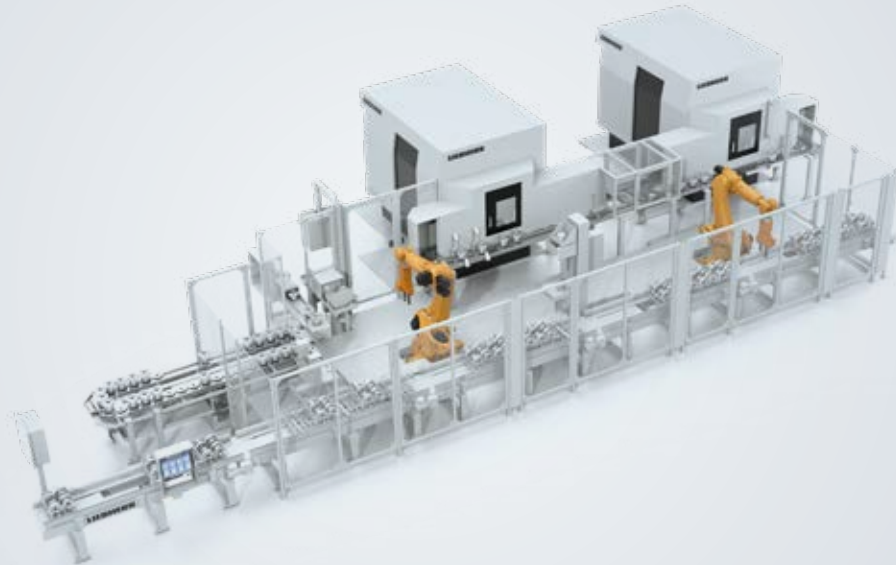
- Sharpening and coating
- Reconditioning of CBN tools



Gear skiving tools

- Two to five times faster than gear shaping
- One to two quality grades better than gear shaping
- Excellent single indexing quality at the workpiece
- Tool life similar to gear shaping
- Available tool designs: conical and cylindrical
- Process-optimized tool design
- Tools available in PM-HSS and carbide (also with indexable inserts)
- Dry skiving possible
- Pressure angle and lead modification possible

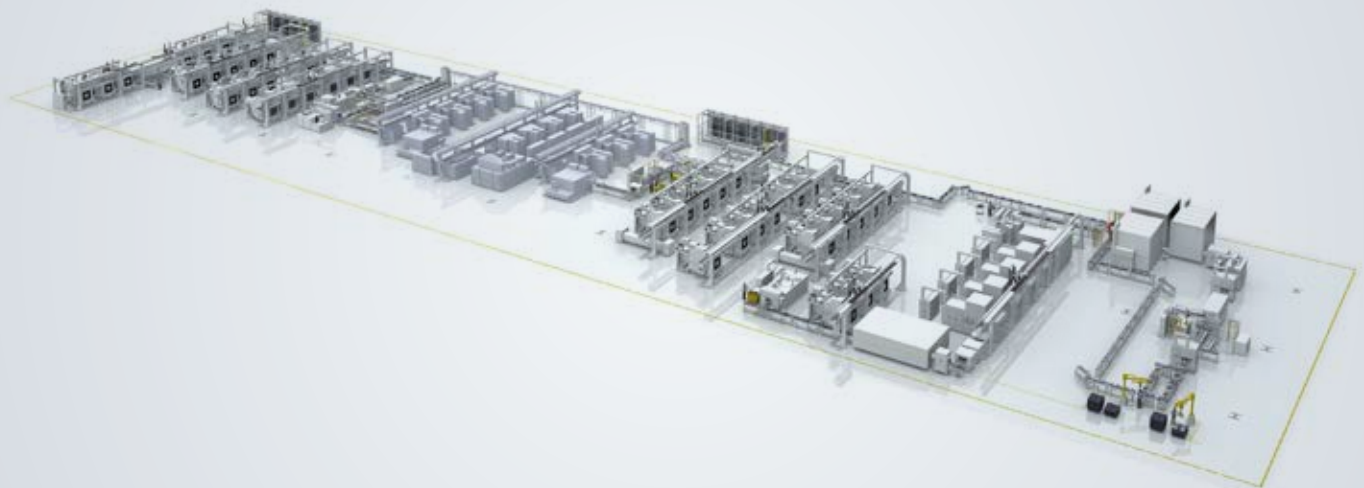
Automation systems: plant and system solutions for the machining industry



Liebherr gear cutting machines with flexible robot automation in the gear manufacturing

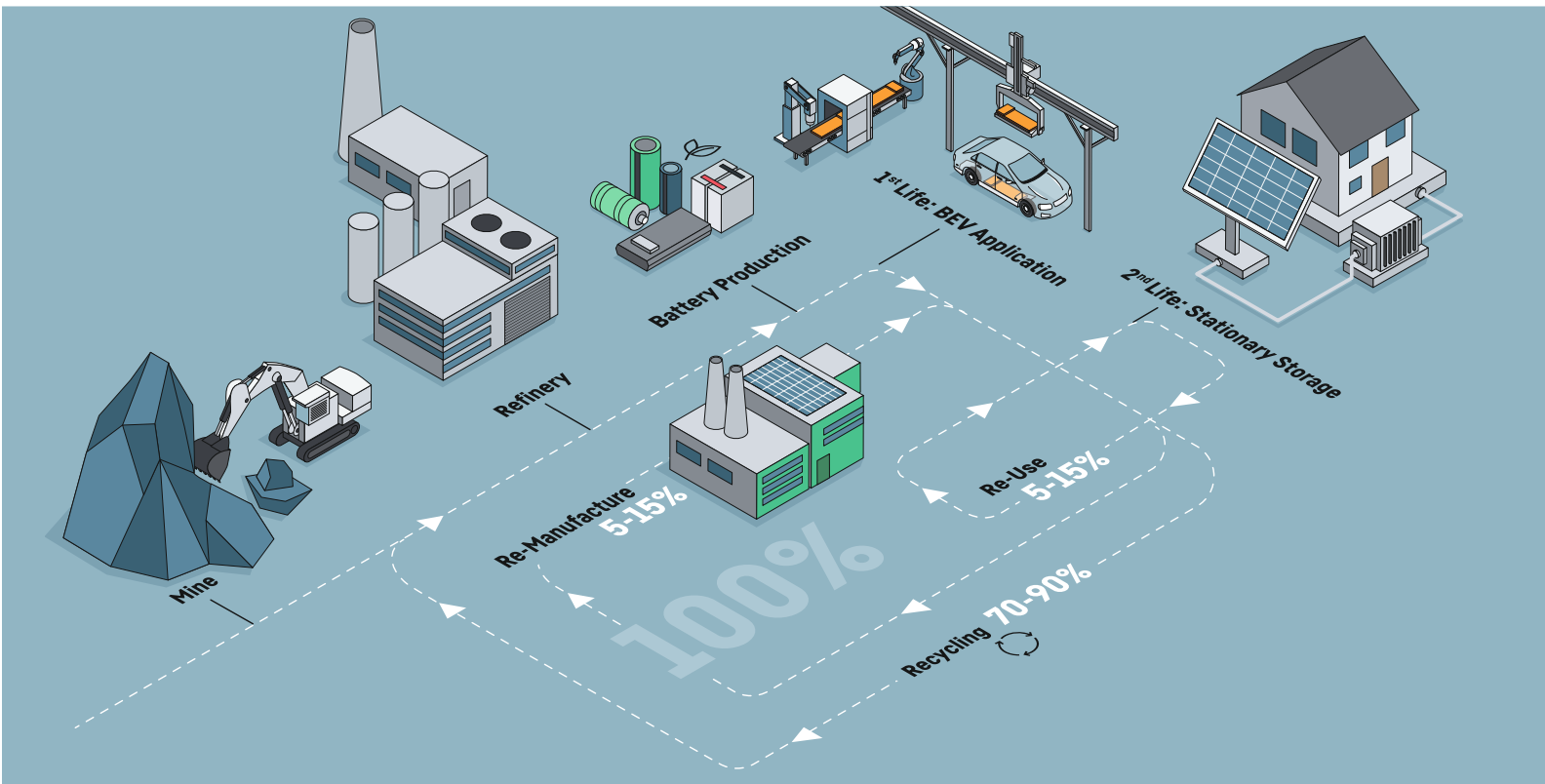
Our core area is the delivery of turnkey system solutions for flexible production cells and manufacturing systems. As a system provider, we integrate all upstream, intermediate, and downstream processes into the overall

concept according to customer requirements. The international collaboration with leading manufacturers of machine tools revealed invaluable potential for operational experience, from which all customers now benefit.



Automotive OEM engine block line. Source: MAG IAS GmbH

E-mobility: automated dismantling of high-voltage batteries



Nurturing a circular economy instead of a throwaway society Re-using, remanufacturing and recycling

The absolute consumption of raw materials in industrialized countries is placing too high a burden on the environment. One of the global sustainability goals is to ensure sustainable production and consumption patterns and to significantly reduce the demand for resources. The circular economy offers an opportunity to decouple growth from the consumption of non-renewable raw materials.

A modern circular economy relies heavily on the prevention, recycling, energy recovery and safe disposal of waste. The aim is to close material cycles where possible and eliminate harmful substances in order to reintroduce waste into the economic cycle as secondary raw materials. The effective utilization of waste as a valuable raw material helps to conserve natural resources.

We can make a significant contribution to the circular economy by already taking into account reuse, repair and recycling in the design and manufacturing process of products.

Circular economy: automated dismantling of high-voltage batteries

Liebherr develops automated dismantling solutions for high-voltage battery systems. The increasing prevalence of battery-electric vehicles leads to questions about the environmental footprint of vehicle batteries, but also about the safety and availability of raw materials and therefore the competitiveness of the German and European industry. Regardless of whether battery components are to be reused or recycled, the dismantling of the battery systems is the first step required in all common process routes.



Video:
<https://go.liebherr.com/m29921>

Gantry robots



LP 200



LPR 200



LP 2000

Linear and area gantry robots from Liebherr perform a wide range of automation tasks. Thanks to a flexible modular system, all sizes can be optimally adapted to the application with additional axes and suitable gripping technology. The maximum load capacity refers to the bottom edge of the Z-axis without gripper, additional axes and workpiece, for a 2,000 mm Z-axis stroke. Higher load capacities are possible with a shorter Z-axis stroke.

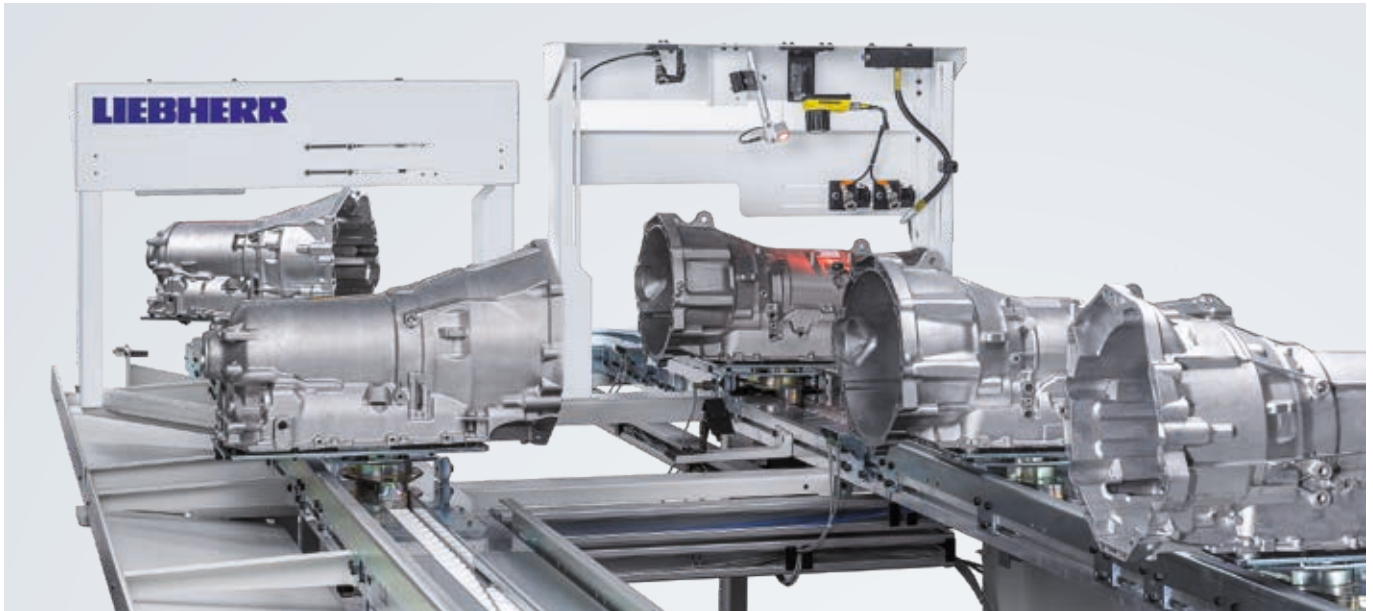
Linear gantry robot

Type	Payload (kg)	Traverse speed X (m / min) (high speed)	Acceleration X (m / s ²) (high speed)
LP 20	220	180	4
LP 200	490	180	3
LP 2000	1,400	120	2

Area gantry robots

Type	Payload (kg)	Traverse speed X (m / min)	Acceleration X (m / s ²)	Traverse speed Y (m / min)	Acceleration Y (m / s ²)
LPR 20	220	180	4	120	3
LPR 200	490	180	3	120	2
LPR 2000	1,400	120	2	60	2

Floor automation and storage systems



Conveying systems

Liebherr conveying systems are adapted not only to the shape, position, weight and size of the range of parts, but to the material as well. Standardised assembly groups provide an ideal enhancement to the programme.

- Plastic chain conveyor
- Indexing chain conveyor
- Tooth chain conveyor
- Drag frame conveyor
- Section roller conveyor
- Pallet accumulating conveyor
- Hinged chain conveyor
- Accumulating conveyor
- Friction roller conveyor

Integration of automated guided vehicles

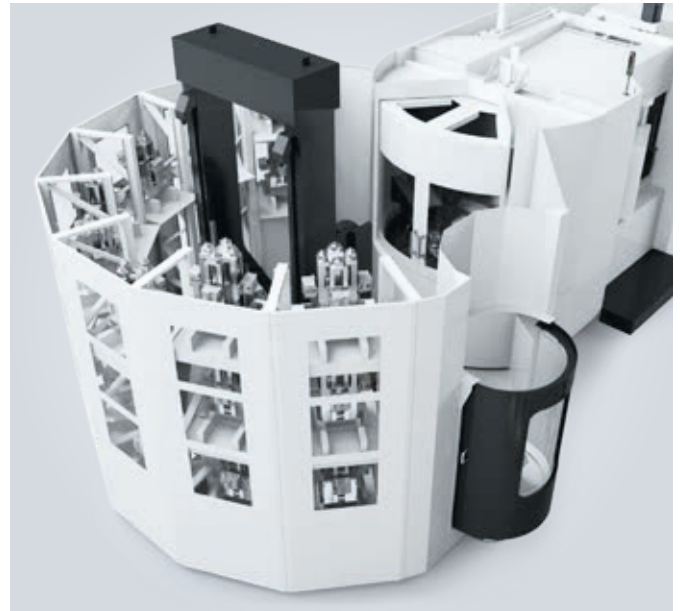
With an AGV system, machines or manufacturing cells can be linked flexibly – fixed paths are no longer obligatory. AGVs are ideal for transport when processing steps need to be flexible:

- When process stations have different cycle times, AGVs can react in real-time and eliminate waiting times.
- When manufacturing sequences change, AGVs can simply respond to this by adapting its course of travel.



Video:
Connecting production flexibly
<https://go.liebherr.com/hmr746>

Pallet handling systems



Liebherr pallet handling systems are deployed to automate machining centers in the area of individual part production and small batch production. Machine pallets with workpieces clamped to them are temporarily stored by the automatic pallet handling system and then distributed to the machining centers. The cell concept enables pallet loading in parallel to machine processes, and can include resource and order planning. The customer benefits from increased productivity and lower labor costs. Pallet handling systems from Liebherr are offered in two versions: as a rotary loading system (RLS) or as a linear pallet handling system (PHS). Both 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 are distinguished by their high storage density in relation to the footprint and are designed for one to two machining centers. In combination with the Liebherr rotary storage tower (RST), the storage areas can be configured individually to meet specific needs. The rotary loading system is available in two sizes and designed for transport loads between 800 and 1,500 kg.

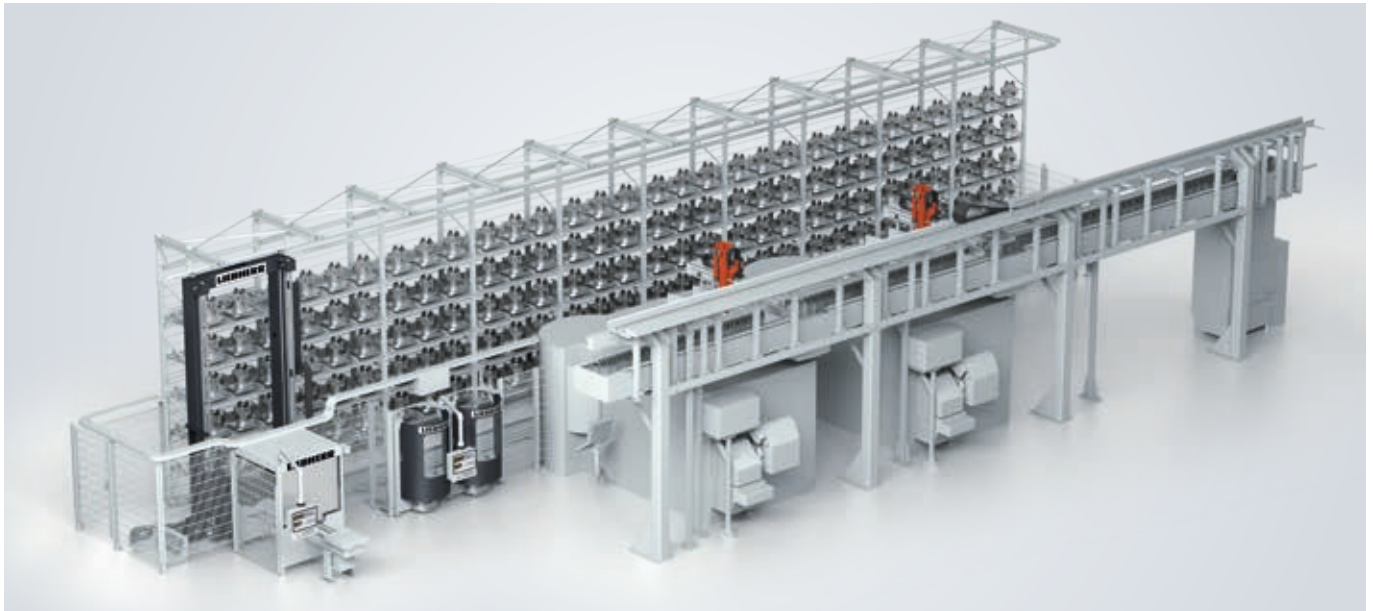
Rotary loading system

Type	Collision circle diameter (mm)	Transport load (kg)
RLS 800	600 / 800	800
RLS 1500	900 / 1,300	1,500

Further load capacities available on request



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



Pallet handling system PHS Allround

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 downtime of the machine tool and replaces the machine's own pallet changer, making a pallet handling system with a double loader the more cost-effective alternative.

The optional front access allows individual machines to be decoupled from the system, without interrupting the automatic mode of the remaining machines.

Pallet handling system PHS Pro

With the linear-type pallet handling system, the modular design allows for multiple machines and expandable set-up and storage areas. The PHS can be extended to manage raw, in-process and finished part inventory. All of the requirements of a modern production system can be integrated. The linear system is manufactured in four sizes for transport loads up to 13,000 kg.

Pallet handling system PHS Allround

Type	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

Pallet handling system PHS Pro

Type	Collision circle diameter (mm)	Transport load (kg)
PHS 750 Pro	900 / 1,400	500 / 750 / 1,200
PHS 1500 Pro	900 / 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 Allround
<https://go.liebherr.com/87KD2N>



Video:
PHS Pro
<https://go.liebherr.com/uxv8rv>

LHRobotics.Vision bin picking software



Bin picking

Our LHRobotics.Vision technology package opens up access to specialist knowledge for industrial robot vision applications. It combines a stereo vision system with powerful software for object identification, withdrawal of parts and robot path planning. The user interface makes it easy to teach-in workpieces and define their picking positions. By evaluating the point cloud of the 3D vision system, the software identifies the components to be withdrawn and then simulates their withdrawal without collisions. The Pro version also simulates the placement process. The Sim license enables the early simulation of the entire bin picking process using 3D CAD data. LHRobotics.Vision is not tied to specific manufacturers and offers Basic, Pro and Sim versions for different requirements. It is therefore an ideal solution for individual applications in the industry.



Video:
Bin Picking
<https://go.liebherr.com/6qj186>

Software



Liebherr Manufacturing System (LMS 4.0)

Software application increases reliability

Complex production systems require increased functionality in their software systems. With the Liebherr Manufacturing System (LMS 4.0), Liebherr offers user-friendly additional software which guarantees process reliability in a production or assembly line. The LMS 4.0 is able to record temporary parts tracking, as well as save specific data and make this available to all system-based users. The system offers a range of assessments and can be deployed, for example, so that correct adherence of the production process can be monitored.

Enhancements such as the new "Production Monitoring App" and "Info Board App" make it easier than ever to track process sequences on mobile devices.



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

Service

Liebherr Academy

Gear technology is subject to constant technological change. This makes it important for gear manufacturers to consistently maintain cutting-edge expertise. Our specialists are happy to support you in this by providing professional training. We train your employees at the new Machine Training Center (MTC) or at your factory, if necessary. The innovative training program covers various products for all technologies.

Customer hotline and remote maintenance

Our experts on the customer hotline provide professional initial assistance when needed. Many faults can be eliminated with the support of our experts via remote access.

Ghost Back-up

Ensure your productivity by storing the current process and machine data. In case of an emergency situation, the software as well as the technology data can be restored quickly and easily.

Digital Fingerprint

During the life cycle of your machine, you can use the digital fingerprint to have the actual status of your machine analyzed at any time by our service experts and compared with the original condition at the time of delivery. Based on this data, our service experts can not only identify technical problems and possible wear, but also support your team with further, preventive recommendations for action.

Expert Service through Remote Service

Permanent operational readiness of machines and systems is an essential requirement for a smooth, profitable operation. With remote service, our software specialists can dial into the machine directly and initiate instant assistance. Machine data or error messages are evaluated and troubleshooting can be carried out online within a short period of time.

Preventive maintenance

The advantages of preventive inspections and servicing are obvious: preventive measures not only increase the availability and therefore the productivity of your machines and systems, but also optimize and reduce maintenance costs by means of early identification of wear and tear and pre-emptive initiation of appropriate follow-up measures.



We have further refined our product range in the area of preventive maintenance and structured it into modular packages to provide you with optimum support in line with your individual maintenance strategy. Our scope of services ranges from pure inspections to regular maintenance and further support packages for emergency situations. These are based on the field experience of our service experts and are constantly revised to ensure that your machines and systems are used as efficiently as possible. Uniform handling ensures the same quality standard in service provision worldwide. The logs are reliable and easy to understand and provide information on the status of the machine.

Worldwide presence and spare parts availability

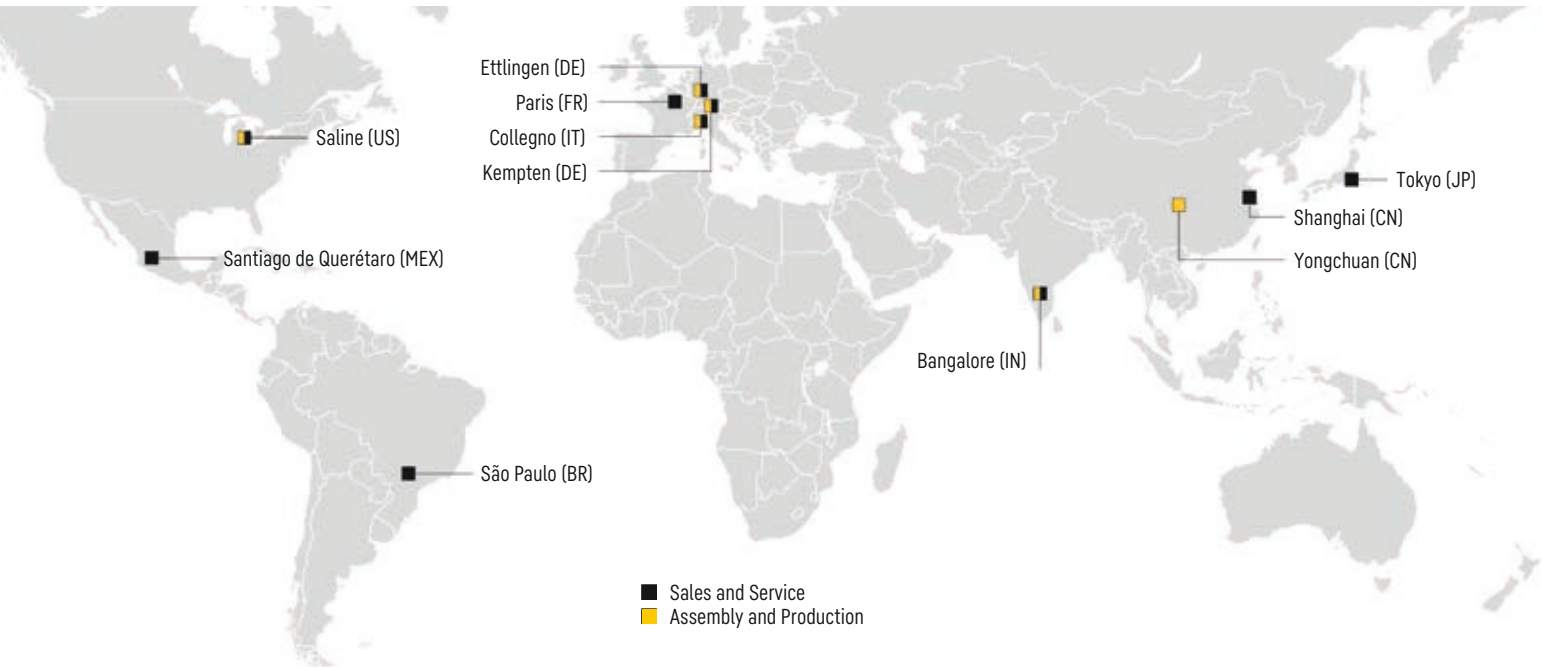
With our headquarters in Kempten, Germany and our offices and service points around the world, we guarantee a very fast response time which enables us to dispatch a service engineer to the customer location immediately if necessary.

Every minute counts for the profitability of a machine or system. This is why the Liebherr Genuine Parts service is specifically optimized for speed and durability. Many parts and components are developed and produced in-house. This optimizes coordination and maximizes the service life of the machines and systems.



Thinking about tomorrow today?
Enjoy discovering our services!
<https://go.liebherr.com/861dbh>

Your solution provider



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