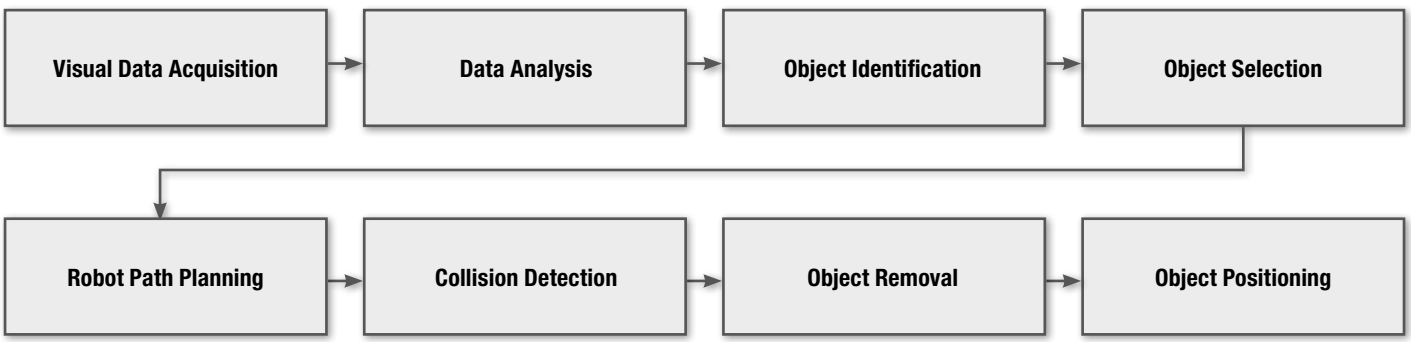
Liebherr robot system for bin picking

LIEBHERR

Liebherr robot system for bin picking

Automatic unloading of randomly arranged parts from transport containers, otherwise known as bin picking, is one of the most challenging industry automation applications. To date, only a few robot designs have met the demands on sturdiness and cycle times. With the flexible robot systems from Liebherr, the bin picking routine can be automated cost effectively. This raises capacities and lowers costs. Many tasks can be solved with tried and tested workpiece handling components from Liebherr's array of automation systems.

Liebherr has many years of experience with automation systems in various areas of industry and applications. This experience has flown into development of the new technology. The Liebherr robot systems are equipped with a reliable and sturdy 3D object detection system as well as powerful software for the segmentation, identification and selection of information. Specially-developed pickers with additional axes enable collision-free access and withdrawal of the parts from the bins (transport containers).

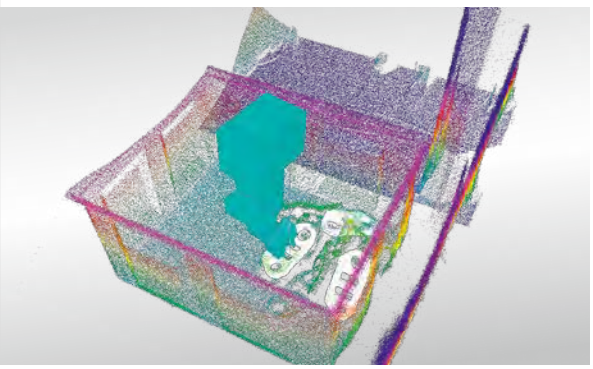


Process description

A complex interaction between image detection system, software and robot is required to unload workpieces from a bin. Based on the range of parts, all of the necessary steps have to be adapted to each other in such a way that optimum withdrawal and positioning is achieved.

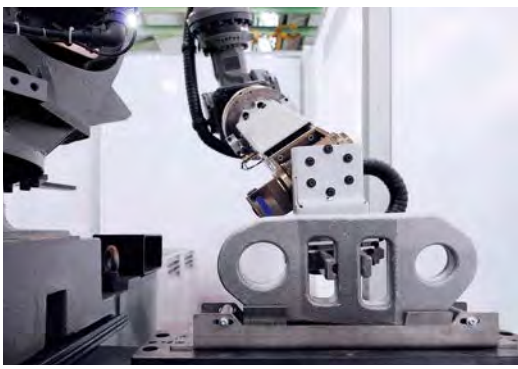
Requirement

Visual Data Acquisition and Analysis



Object Identifi cation and Selection

Collision-Free Work Piece Unload



Object Positioning

Requirement
Randomly arranged parts need to be removed from a bin.

Object identification and selection
Specially-designed software segments, identifies and selects the information about the workpieces as well as the technical framework conditions.

Collision-free withdrawal of parts
The intelligent picker has additional axes and enables collision-free withdrawal of parts from the bin.

Optical data detection and assessment
A reliable, sturdy 3D object detection system detects the data optically and evaluates it.

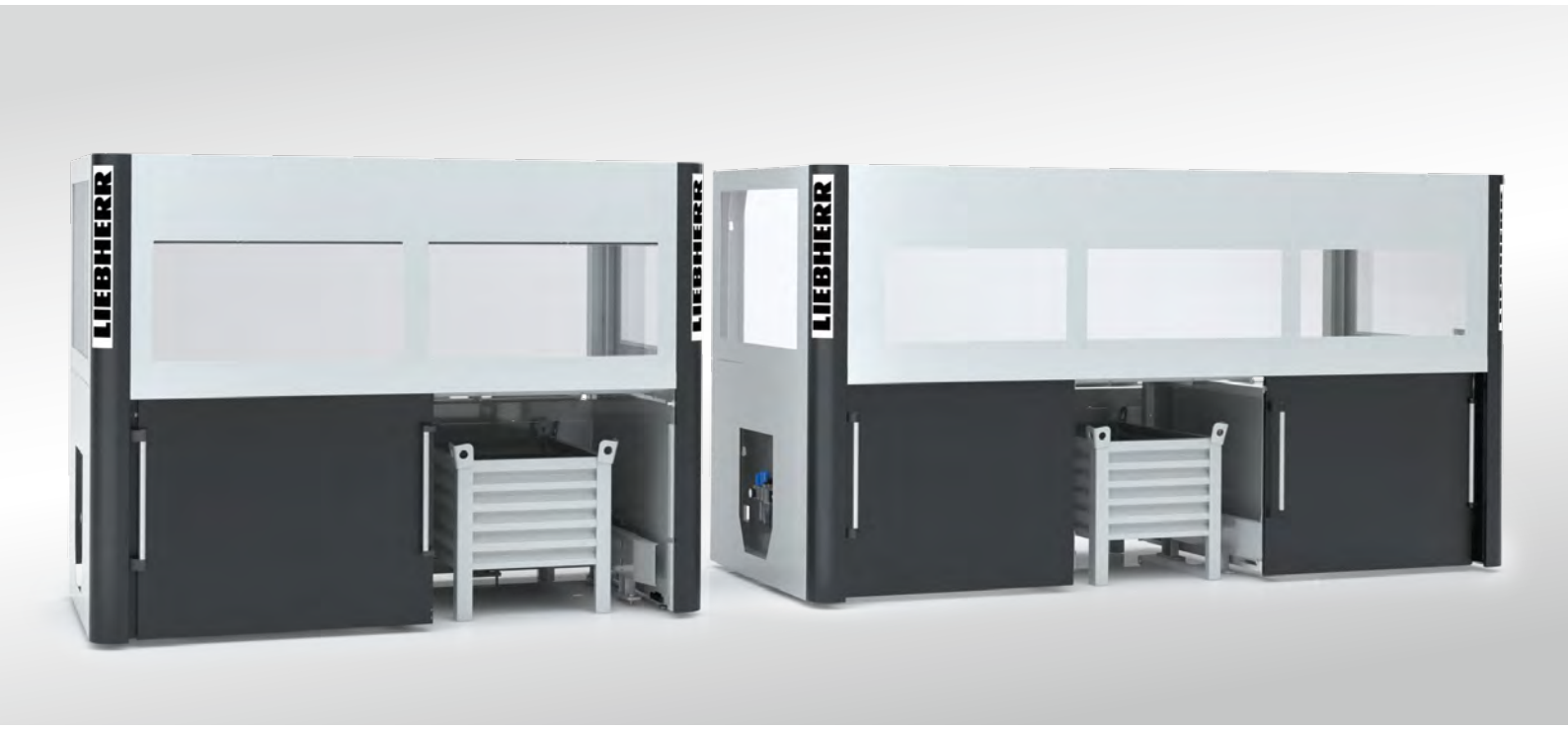
Object positioning
Finally, the tools are precisely positioned at the defined location or on a machine.

Flexibility

Supplying	Handling	Options	Output

The modular structure of the robot cell comprises two base modules, the supply module and the handling module. These can be combined with a customer-specific option and output module.

Supplying



The hook-ready supply module serves to provide workpieces for the handling module. As a basic version, it is available with two or three areas. These consist of provisioning areas for e.g. pallet cages or bins made of steel or plastic up to a maximum size of 1,200 mm x 1,000 mm x 1,000 mm (LxWxH). Depending on the task, the module can be supplemented with a mobile vision system as well as operator protection for loading and unloading of bins in parallel with machine operation. The basic modules can be joined together and enhanced flexibly.

Provisioning area

Operator protection

Vision system (with transport container)

Handling

Basic module

Robot system

Surface portal system

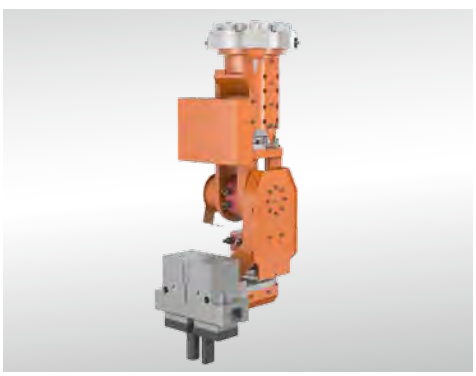
The Liebherr robot cell is underpinned by the standardised hook-ready handling module.

Various loading systems can be integrated in this link between supply and output module, along with controls and an operator panel.

The handling and supply modules are coupled together by a mechanical and electrical connecting system. Positioning and setting-up of the individual components are made much easier for the customer in this way. Depending on the task, a flexible picker unit is available in sizes ranging from 0 to 5 kg, 5 to 20 kg and 20 to 40 kg. In combination with suitable compensation elements, a high availability of the system is guaranteed. If required, the pickers can be supplemented with a 7/8 axis. In this way, flexibility during picking of the workpieces within the bin is increased. The degree to which the bin is emptied is optimised.

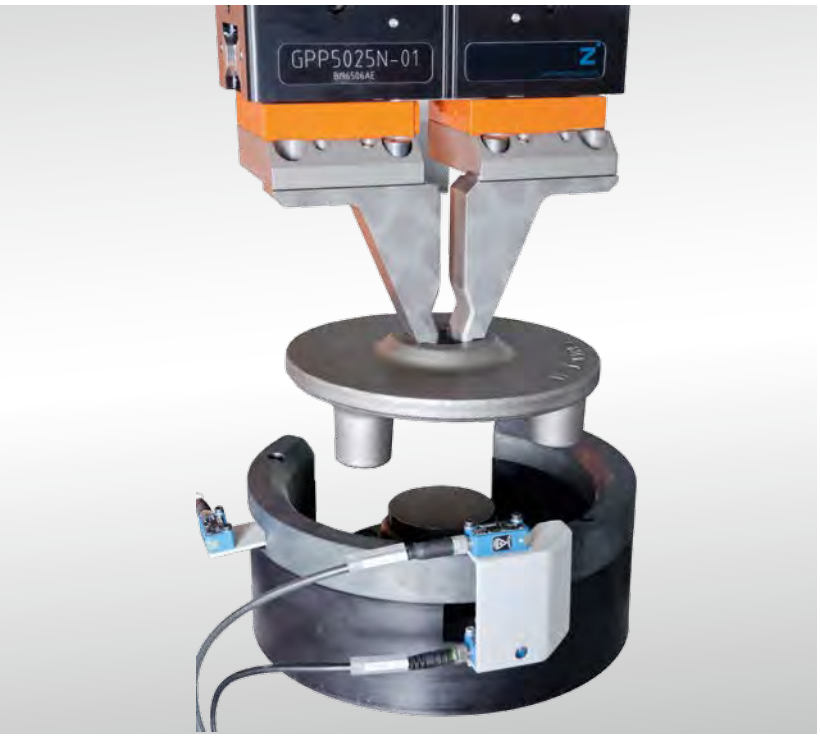
Picker with compensator unit

Picker with 7/8 axis

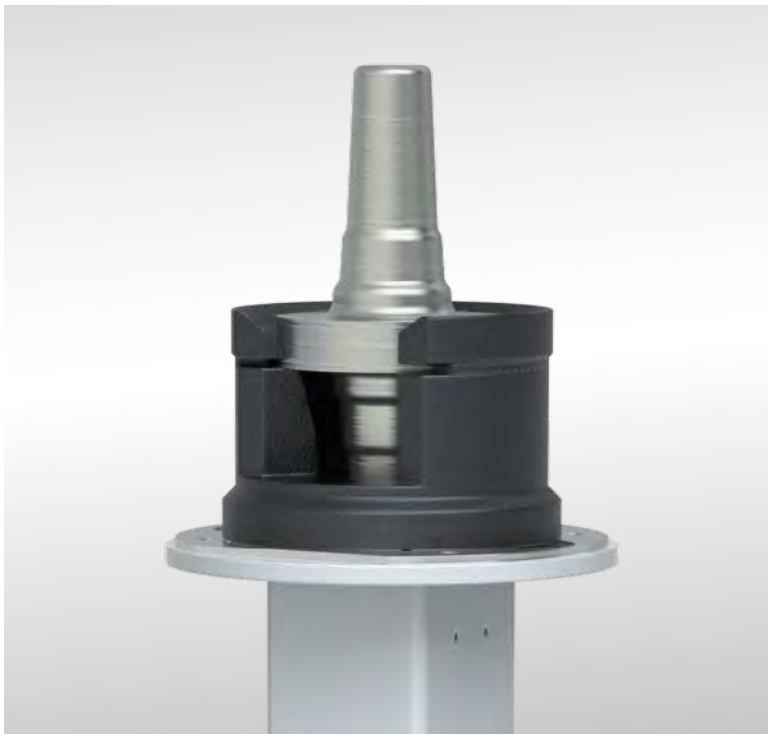


User interface with controls

Options



Intermediate storage



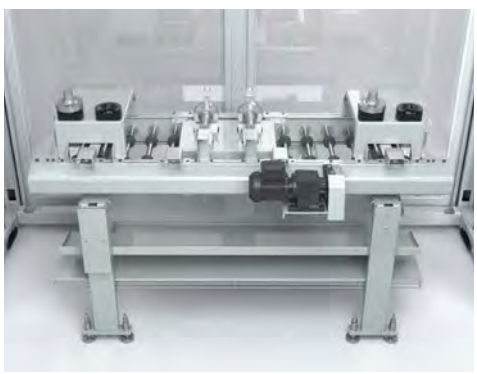
Repicking station (actual image)

To optimise the unloading process from the bin, the workpieces are picked at different positions. These picking positions are not always suitable for final positioning of the workpieces. If necessary, Liebherr can offer suitable options such as intermediate storage areas, repicking stations, positioning devices or detection stations.

Output
The workpieces withdrawn from the bins can be transferred to a wide range of different customer-specific systems. Examples of this are direct loading of a machine tool, handover to a transport system or organised storage in bins further down the line.

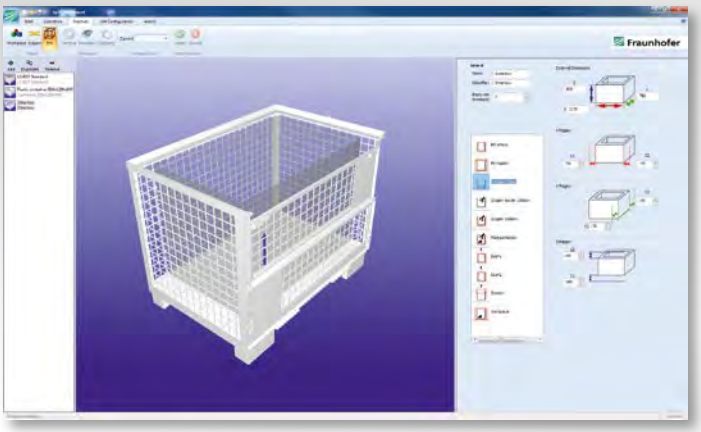
Direct loading of machine tool

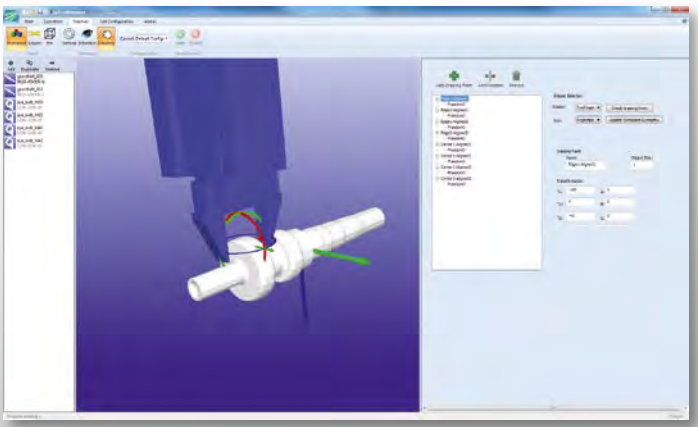
Loading transport system



Loading caged pallet

User-friendliness





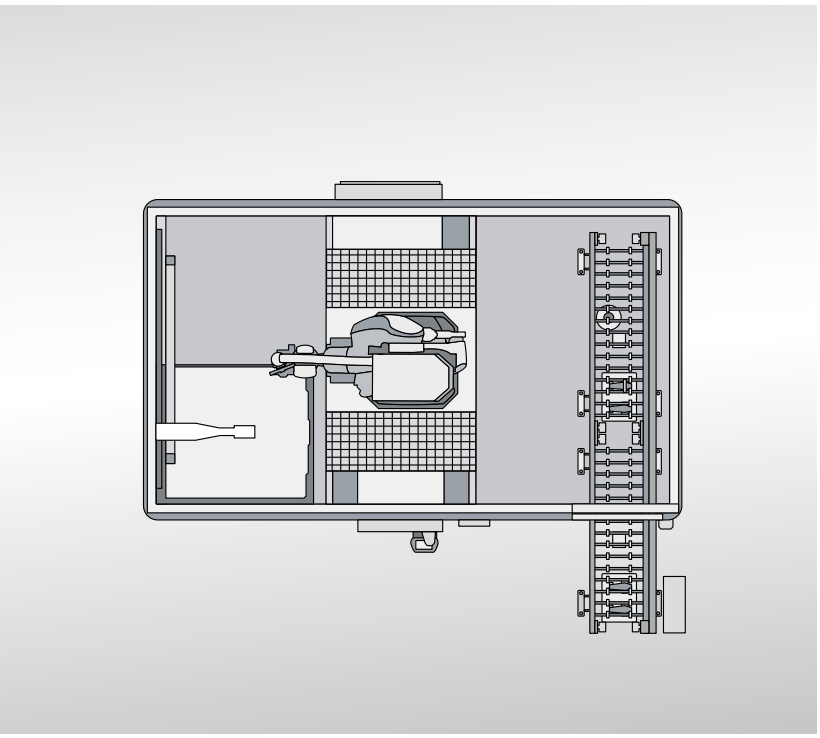
The control panel makes it possible to enter all of the necessary information quickly in easy steps:

- Teach-in of workpieces and definition of potential picking points
- Configuration of bins (by entering dimensions or integrating existing data)
- Configuration or adaptation of pickers
- Selection of employed robots to check working area
- Input of obstacles present in robot's working area
- Calibration of system
- Definition of framework conditions for collision-free withdrawal of parts
- Rail scheduling

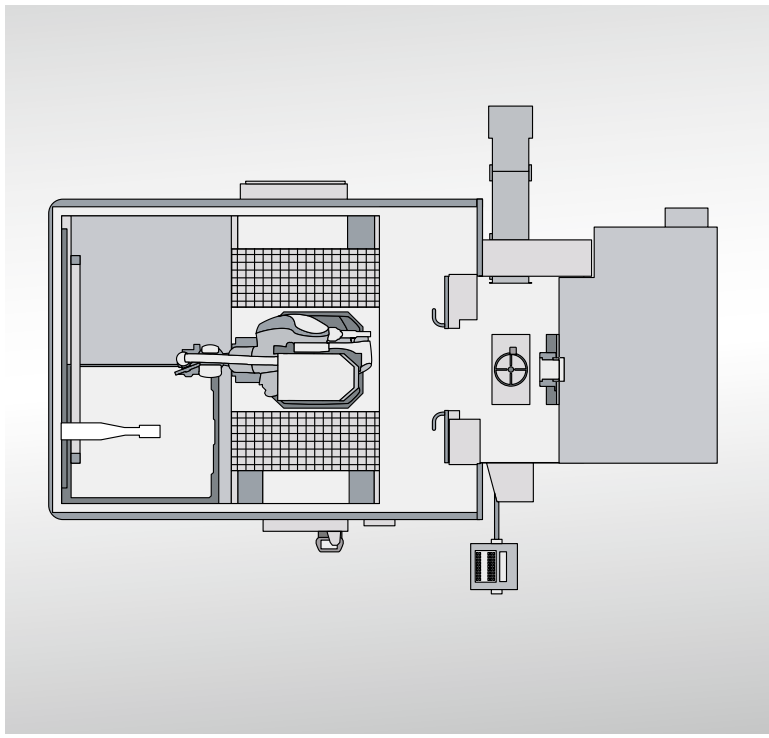
The processing stages are entered in a user-friendly manner via a menu-based control panel. Special programming knowledge is not required. Depending on which data are available from the customer, configuration of the work steps is carried out by means of:

- parametrisation with illustrative guidance
- already existing data sources (e.g. CAD data)
- interactive 3D configurator

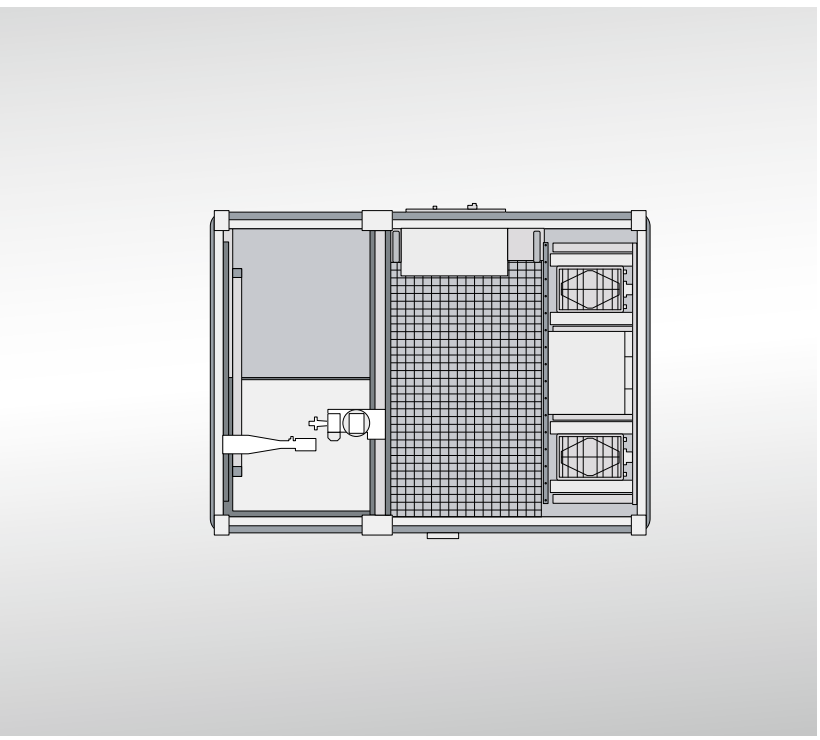
Examples and types of layouts



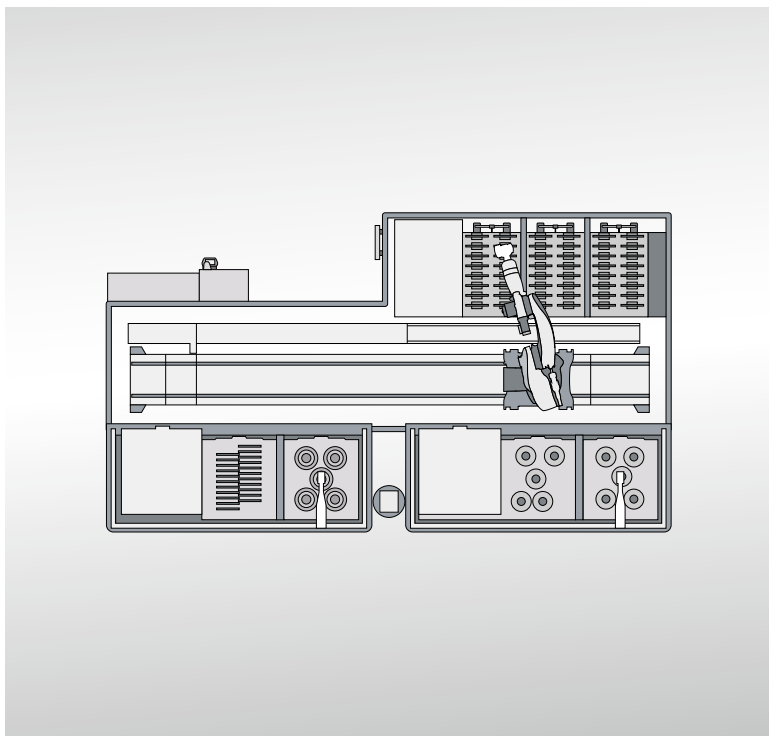
Conveyor loading



Machine tool loading



Wiret basket loading



Commission Handling

Service and maintenance

Liebherr Service has its headquarters in Kempten (Germany), and has a network of Liebherr support centres around the world. The experts who man the customer hotline provide professional first-aid should help be needed. Included in the services offered are the provision of spare parts, inspections, maintenance or modifications to systems. Since the products have a universal modular design, rapid provision of spare parts is assured, which means that periods out of use are kept to a minimum.

The Liebherr robot cell was designed to be maintenance-friendly throughout. All of the necessary lubrication points are supplied from a central lubrication pump. As with all pneumatic components and bus modules, this is located on a maintenance unit that can be accessed easily from outside. Every robot cell 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.

Liebherr-Verzahntechnik GmbH
Werkzeugmaschinen,
Automationssysteme
Kempten
(Deutschland und Europa)

Liebherr Automation Systems Co.
Saline, Michigan
(USA)

Liebherr Brasil Ltda.
Guaratinguetá / SP
(Brasilien und Mexiko)

Liebherr Machinery Service Co. Ltd.
Shanghai
(China)

Liebherr-Russland OOO
1 Borodinskaja Str. 5
Moskau
(Russland)

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

Liebherr-Verzahntechnik GmbH
Werk Ettlingen
Gear Cutting Tools
Hertzstraße 9-15
76275 Ettlingen, Germany
☎ +49 (0)7243 708-0
Fax +49 (0)7243 708-685
tools.lvt@liebherr.com

Liebherr-Utensili S.r.l.
Gear Cutting Tools
Via Nazioni Unite 18
10093 Collegno TO, Italy
☎ +39 (0)114 248711
Fax +39 (0)114 559964
info.lut@liebherr.com

Liebherr-Gear Technology Inc.
Machine Tools
Liebherr Automation Systems Co.
Automation Systems
1465 Woodland Drive
Saline, MI 48176-1259, USA
☎ +1 7344 297225
Fax +1 7344 292294
info.lgt@liebherr.com

Liebherr-Machine Tools India Pvt. Ltd
Machine Tools
353/354, 4th Main, 9th Cross, 4th Phase
Peenya Industrial Area
Bangalore - 560 058, India
☎ +91 (0)80 41 273033
Fax +91 (0)80 41 272625
info.mti@liebherr.com

Printed in Germany by Roth BK LVT Bin Picking 1-10.15_en Subject to technical modifications.

Liebherr-Verzahntechnik GmbH
Verzahntechnik und Automationssysteme
Kaufbeurer Straße 141, D-87437 Kempten
☎ +49 (0)831 786-0, Fax +49 (0)831 786-1279
www.liebherr.com, E-Mail: info.lvt@liebherr.com