

Gear-Shaping Machines

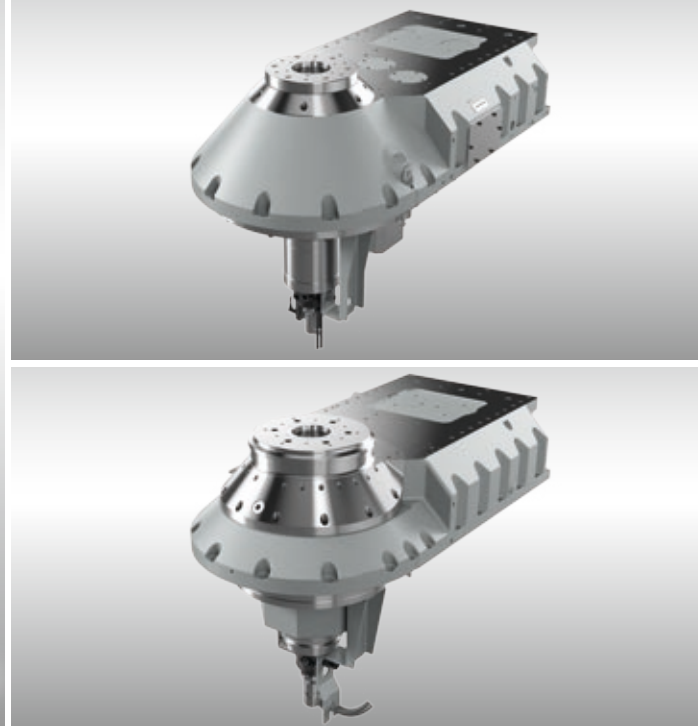
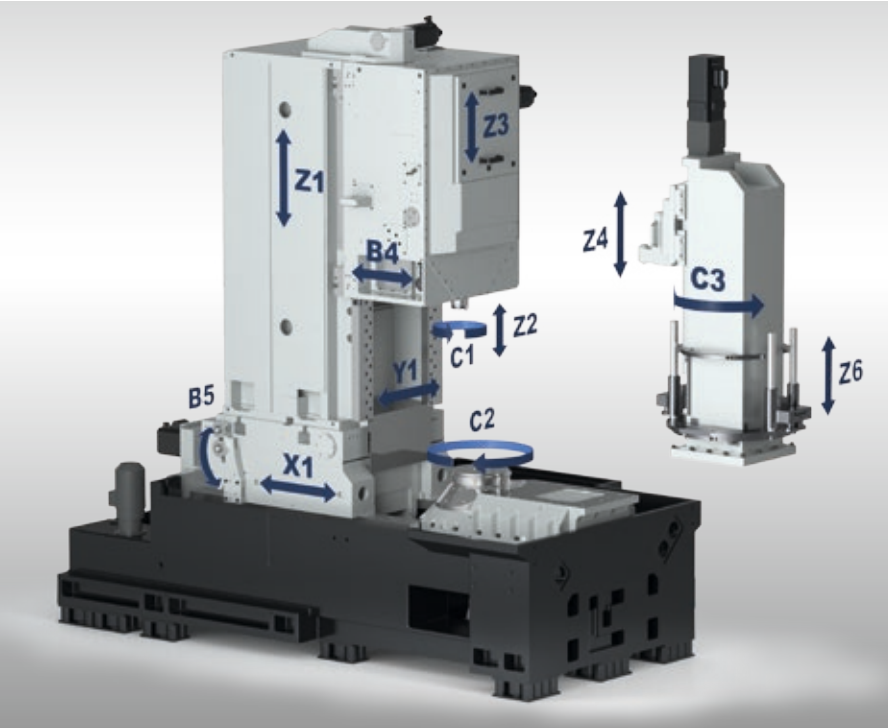
LS 200-500 F and LS 200-500 E



LIEBHERR

The Machine Concept

T-2-G



T-2-D-400

The Liebherr gear shaping machines are optimally tailored for universal use. The machine's movable shaping head design allows manufacturing of a variety of parts with minimal setup times. With the variable height of the cutting head, it is also possible to cut multiple gears in one setup.

The machine concept is based on a modular platform system, with component groups that are also used for the Liebherr hobbing and grinding machines. This permits cost effective manufacturing of individual components. The machine concept is suitable for wet processing as well as dry processing in equal measure.

The Table Drive

Achieving the highest gear quality requires a completely backlash free table drive. Additional to the gear driven tables, highly dynamic direct drives are available that meet all requirements regarding speed and accuracy.

The axes

X1 – Radial travel main column
Y1 – Column offset
Z1 – Stroke position adjustment
Z2 – Stroke length adjustment
Z3 – Stroke travel tool
Z4 – Vertical travel tailstock arm

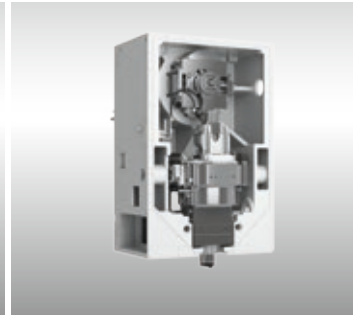
Z6 – NC-lift station
B4 – Tool relief motion
B5 – Column swivel axis
C1 – Rotary motion tool
C2 – Rotary motion work piece
C3 – Rotary motion ring loader

The Shaping Heads

With its wide range of shaping heads and machine tables, the modular machine concept allows the gear shaping machine to be configured specially for your applications. This variety allows us to give our customers the best and most economical solution for their process.



SK 1.70



SKE 120



SKE 240

LS 200–500 F

Fields of application

- Mass production with low levels of parts variance
- Contract manufacturing of large volumes

Customer benefit

- Machining of external and internal gears
- Good static and dynamic stiffness
 - High cutting speeds, even with small gear width
 - Maximum productivity in all applications
- Improved gear cutting quality
- Longer tool life

LS 200–500 E

Fields of application

- Small- to mass production with high levels of parts variance
- Universal contract manufacturing of small batch sizes

Customer benefit

- Maximum flexibility in production
 - Machining of external and internal gears
 - Gear shaping of cluster gears with different helix angles
 - Easy programming of helix angle up to 50° with correction facility
- No more time-intensive machine set-up
- Programmable lead modifications

Shaping head		SK 1.70	SKE 120	SKE 240
Max. module	mm	5	8	12
Stroke speed	min ⁻¹	1,500	1,200	1,000
Stroke length	mm	70	120	240
Drive power	kW	17	35	55
Accelerated return stroke		no	optional	optional
Guide concept		Change guide mechanical	Straight/helical · electronic controlled	Straight/helical · electronic controlled

Additional Equipment



SGA Method (Gear Shaping with Crossed Axes)

Thanks to the SGA cutting method developed by Liebherr, the use of cylindrical cutters without clearance angles makes it possible to keep the material costs per workpiece down to a very low level. The clearance angles required for cutting are facilitated by the column tilt angle. A special cam is used to ensure that the tooth root of the sprocket runs straight despite crossed axes.

SSM (Shuttle Stroke Method)

With this method, oversize face widths can be shaped, which are larger than the maximum working area of the machine. The desired face width is split into several increments with corresponding stroke lengths. With the relevant setting, these incremental lengths are processed one-by-one until the overall face width is cut to size.

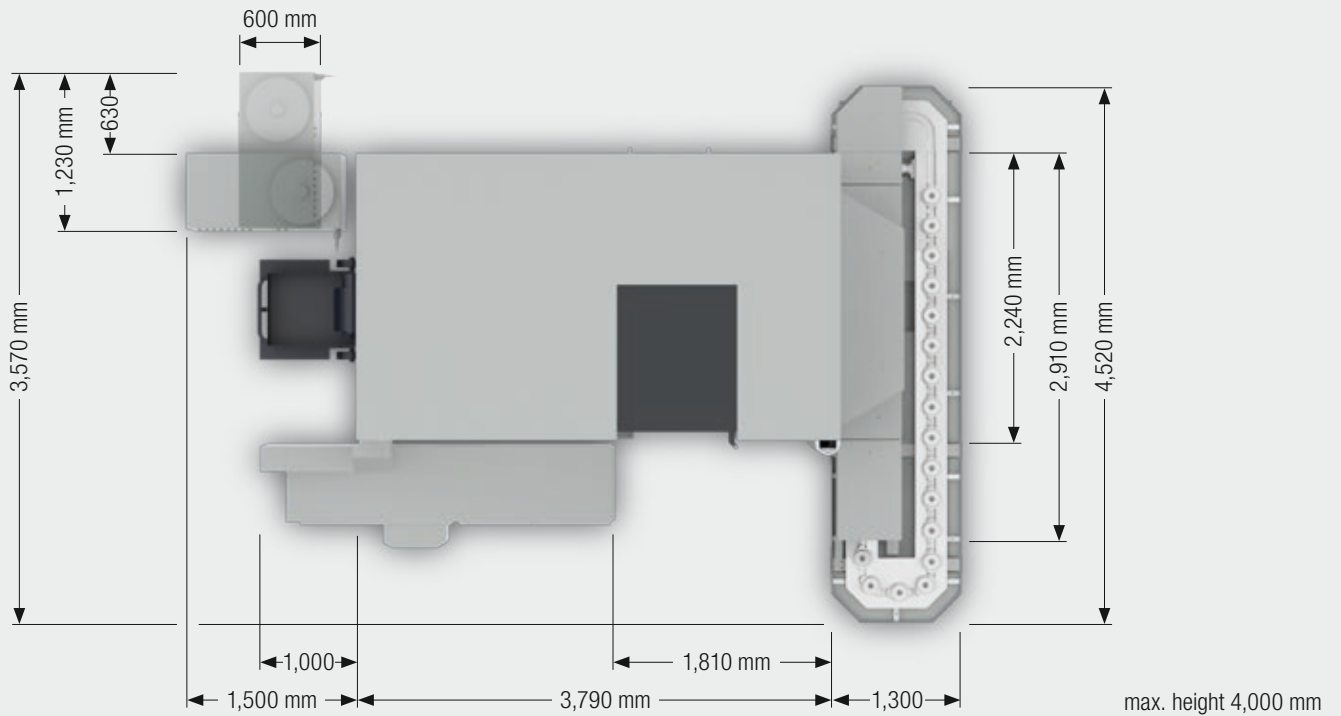
Wafer Tools

Tool setups are a significant part of the overall production costs. This cost portion can be reduced with the use of wafer cutters with their constant diameter. With wafer tools, several workpieces can be processed at the same time, which helps to assure the highest output.

Deburring

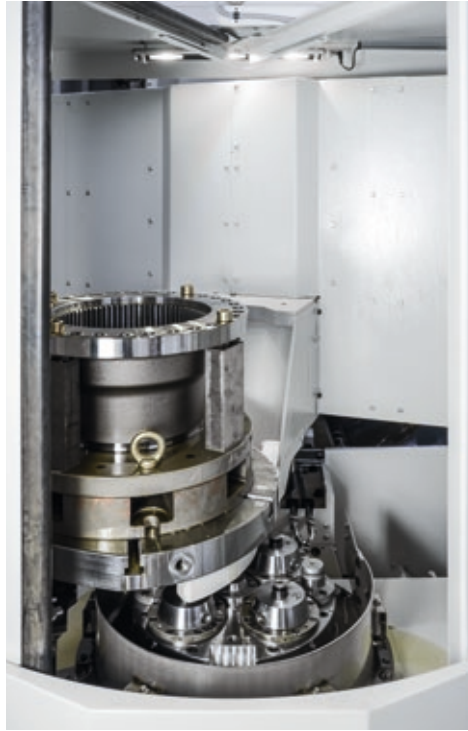
In the Liebherr gear shaping machines, it is possible to perform coarse deburring measures in the working area. As additional options, simultaneous pressure deburring and centrifuging in the 90° position of the ring loader are possible.

Technical Data



		LS 200/300/380/500 F	LS 200/300/380/500 E
Normal module	mm	5	8/12
Max. cutting diameter	mm	200/300/380/500	200/300/380/500
Stroke length	mm	70	120/240
Centre distance cutter spindle / work table	mm	-50 ... +450	-50 ... +450
Axis angle cutter spindle / work table	deg.	± 0.28 ± 0.5	± 0.4
Column swivel axis		-1 ... +12	-1 ... +12
Stroke position range cutter head slide	mm	400	650/300
Stroke speeds infinitely variable as standard	DS/min.	1,500	1,200/1,000
Feed rotary axis cutter	mm/min.	3,750	3,750
Total weight	approx. kg	18,000 - 19,000	20,000 - 21,000

Internal Automation Possibilities



Ring loader

The ring loader makes simultaneous loading and unloading possible. The average loading time is 0.1 min. Gripper versions are fitted as parallel (e.g. gears) and swivel grippers (e.g. shafts). No tools are required for the gripper quick change feature. The ring loader can be loaded up to 100 kg in weight.

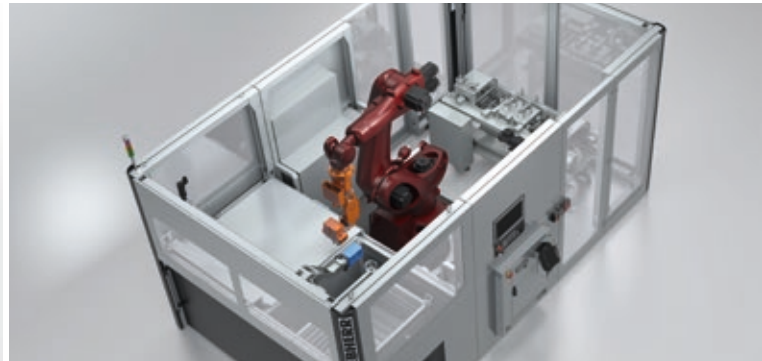
Lift/Tilt Loader

The lift/tilt loader is suitable for larger and heavier workpieces weighing in excess of 70 kg. Since the unmachined parts are set-up on a carrier plate simultaneously, the machine is not idle during the process. Changing from unmachined to machined parts is performed within 15 seconds.

Tool Changer

The tool changer is a storage magazine for preset tools. Changing of the tools is an automated process. The advantages of this, for example, are in the processing of cluster teeth as well as in the automated exchange of roughing tools (e.g. HM-WSP cutting wheels) to finishing tools. With this tool delivery system, a high turnaround can be achieved. Replacement of a measuring sensor is possible as an option.

External Automation Possibilities



Palletizing Cell (LPC)

Standardized transport containers with basket technology facilitate a uniform approach to logistics as well as flexible future-oriented production.

Plastic Chain Conveyor (KKB)

The plastic chain conveyor is available in the standard version for workpieces up to 20 kg in weight and in the heavy duty version for workpieces up to 180 kg in weight, and is designed to transport any number of irregularly shaped workpieces without them coming into contact with each other.

Robot Cell (LRC)

Hook-ready robot solution in modular design replaces complex sorting systems, increases productivity, and alleviates burden on personnel.

Drag Frame Conveyor (SRB)

Drag frame conveyors serve to transport parts with a flat surface, e.g. bore-type gears, hubs or rings. The workpieces are dragged by a frame that is connected to a chain.

Hinged Chain Conveyor (SKB)

With the aid of hinged chain conveyors, it is possible to transport workpieces with a flat surface, e.g. bore-type gears. Depending on the scenario, multi-track versions are also possible.

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.

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