COMPLEX ALUMINUM PARTS "FROM ONE CAST"

Teamed with a RoboJob tower, the Maxxmill 750 automated vertical milling machine ensures maximum quality and productivity

Short description

- **Assignment:** Fully automated, manless serial production of batch sizes between 10 and 1,000 units
- **Solution:** Manless multiple-shift operation of the Emco Maxxmill 750 with RoboJob tower
- **Use:** Flexible and productive solution for complex, large serial productions with high part precision and reduced processing time

The Maxxmill 750 vertical milling machine with RoboJob tower has been in use at Günter Friedrich GmbH since April 2022.

Located in the Hessian Liebenau, Günter Friedrich GmbH is a modern casting business with downstream precision manufacturing facilities that produces complex parts for demanding sectors such as the medical technology, the electrical or the automotive industry. Thanks to the new Emco Maxxmill 75 vertical milling machine for 5-axis machining and the RoboJob tower, the business can fulfil all demands in a short time and with high productivity.

Consistent, sustainable decisions for the future

Knut Friedrich, owner and director of Günter Friedrich GmbH, does not make compromises when it comes to topics important to him. Sustainability is such a topic. That is why he installed large photovoltaic systems on and next to the company buildings which produce more green electricity than the entire business requires. That way, the company has been more than CO2 neutral since 2020.
Knut Friedrich is just as consistent in his dealings with customers and suppliers. ‚We are always honest and open, which is something our business partners appreciate. Not least due to that, our customers involve us early in the product creation process, and more and more often, we deliver not just cast blanks, but readily processed products from a single provider. Today, those already make up 60%, with rising tendency.‘
Because of that, the metal moulding foreman and economist expects partnerships at eye level that are just as open and mentions the machine tool manufacturer Emco as an example, whom he first met in 2006 at a trade fair. It was not just the performance data of the Emco Maxxmill 500 offered there that convinced Knut Friedrich, but also the ensuing practical trials. ‚We bought that machine, but the great thing came afterwards. We gained experiences in the practical operation, from which we developed ideas as to how the machine could be improved by small adjustments. Emco actually implemented these things in the next series. That impressed me, and we invested in further Emco machines throughout the years.‘

Complete machining is becoming ever more important

A lot has changed since at Günter Friedrich GmbH, especially in the area of precision machining, which is implemented downstream of the casting processes. These days, the company produces parts from 15 different aluminium cast alloys and has expanded its regular product range from a few hundred to approximately 5,000 different items, both individual parts as well as recurring series of partly several tens of thousands of units. In doing so, Friedrich offers everything from a single source – from the first material analysis to moulding, casting, machining, cleaning and final quality testing to assembly, packaging, and dispatch.
High product quality, speed and adherence to delivery dates are defined as the most important values, and the family business attaches special importance to qualified personnel and state-of-the-art technology. The owners therefore invested in their first Emco vertical milling machine for 5-axis machining as early as in 2011. In late 2021, they decided to purchase a vertical milling machine with automated robot assembly. ‚That way, we can productively take care of the ever increasing complex and large serial orders‘, says Knut Friedrich, and mentions, ‚Since we have had good experiences with Emco and the regional responsible sales director Jörg Möbius several times before, that was an advantage for the Austrian machine manufacturer, but not a ‘free ticket’ in the decision process.‘

Vertical milling machine for 5-axis machining with a tower solution from RoboJob

Together with his production manager, Christopher Bode, the company director compiled important criteria for selection. They compared several suppliers and performed trials with real parts using the automated machines they were considering.
In the end, the combination of an Emco Maxxmill 750 vertical milling machine and the robot-assisted tower solution from RoboJob proved itself the best solution.
The combined solution has been in operation since early 2022. Thanks to the compact machine design in a closed cast and welded steel construction, the Emco Maxxmill 750 reaches high stability. That makes precision in the hundredth millimetre range and surface qualities of Rz = 1 µm possible in the practical

The robot-assisted tower solution from RoboJob teamed with the Emco Maxxmill 750 makes it possible to machine parts around the clock.

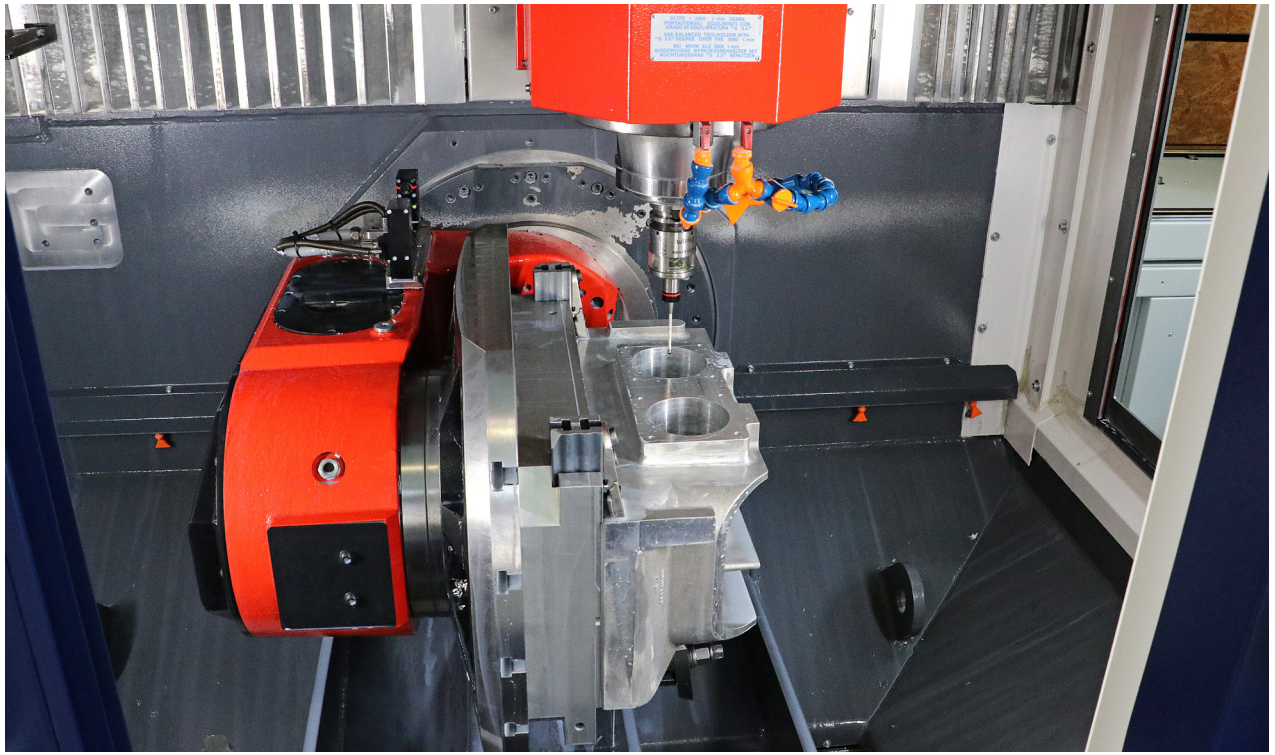
operation with the part. Thereby, the machine makes it possible to subject workpieces with weights of up to 500 kg and edge lengths of up to 530 x 530 x 417 mm to five-axis machining in one set-up. ‚That increases the part precision and reduces the machining time significantly', explains Emco regional sales director Jörg Möbius, and manufacturing manager Christopher Bode adds, ‚Some workpieces can't even be profitably produced without 5-axis machining anymore.'
The machining expert also finds the machining area with few interfering edges as well as the worktable of the Emco Maxxmill 750 to be optimally fitting for his requirements. The worktable is a swivelling table that is mounted at the B-axis on one end. Christopher Bode explains, ‚We can clamp parts in any place we want, even eccentrically, which gives us enormous flexibility in the application. Among other things, we are able to machine complex individual workpieces that are even larger than the table.'
The machine can be loaded laterally through the robot, manually from the front or from above using a crane, as the roof of the Maxxmill opens.

Robot works in three-shift operation

As the new vertical milling machine is fully automated with RoboJob, serial productions are dealt with just as efficiently and extremely fast by the Friedrich milling team. According to Knut Friedrich, the batch sizes are usually between 10 and 1,000 units. Batch sizes in the mid-five-digits are the exception, ‚but they do come up every now and then and pose no issue for us', the company director clarifies.
‚Because other than my staff, who I very consciously have working in only one shift, we regularly operate the combination of Emco Maxxmill 750 and RoboJob tower in three shifts, manless, of course.'
The robot uses a charging station which is powered by a lift in the almost five-metre-high tower. Loaded with the corresponding amount of cast parts to be processed, everything works fully automatically as soon as the manufacturing process is started. But before that, the robot and the machine need to be set up, a job that is currently first and foremost taken care of by manufacturing director Christopher Bode. ‚While it is not entirely trivial to learn the handling of the seven-axis robot, the clear software makes its programming significantly easier. The workflows are very logical, and once you get the hang of the principle, it is not a problem at all.'
According to Bode, the programming and setup of the robot are done within one working day. He first enters the design of the workpiece and the tool tensioning system into the robot software, so the robot arm can grab it correctly. Afterwards, Mr. Bode has to teach the robot the positions of the blank upon reception in the charging station and deposition in the machining area.
The same goes for the reception of the finished part in the machining area and the deposition in a layer afterwards. When doing so, all interfering edges must always be taken into account. ‚I use a hand-held panel to manually teach the robot these four positions. Then, I let the robot process the entire job slowly and check whether everything works smoothly. Here, I still have the opportunity to make fine adjustments.'

Parts can also be clamped in eccentrically

Knut Friedrich mentions the open and honest collaboration with the supplier that is so important to him as the basis of



Friedrich does not use the Emco Maxxmill 750 exclusively for serial production. Thanks to its flexible loading possibilities from the front and from above, the vertical milling machine can also mill larger and more complex individual parts.

all success. Thus, all challenges were addressed beforehand and finally mastered. In the end, in early 2022, Emco as well as technicians from RoboJob invested three weeks of installing time as well as an additional week for parameterising the robot, i.e. teaching it all endpoints and the few interfering edges in the work area.
Afterwards, another week was used to bring in test parts in order to make sure that Emco Maxxmill 750 and RoboJob were working in perfect harmony. ‚Since then, the combined solution has been in reliable operation with us. We only optimise minor details from time to time. And if we require support for that, we can always rely on receiving that from Emco or RoboJob via remote maintenance within the shortest amount of time', rejoices company director Knut Friedrich.

Friedrich determines the required precision by quality inspections on a random basis. Thanks to a highly rigid machine design, the Emco Maxxmill 750 reliably reaches high precision in the hundredth millimetre area as well as surface qualities of Rz = 1µm in practical operation.

Glad about honest, open and successful collaboration (from left to right): Vladimir Farkas, product manager for milling at Emco; Jörg Möbius, regional sales director at Emco; Knut Friedrich, owner and director; Nicole Friedrich, commercial management; Nick Hansen, skilled worker at Günter Friedrich GmbH.

Based in Liebenau-Lamerden, Günter Friedrich GmbH was founded in 1963 and today employs a staff of 34.
The modern casting company with downstream precision manufacturing facilities delivers complex products from a single source. In addition to the medical technology, electric and automotive industries, radiator building, optics, fine mechanics and agriculture also rank among the most important customer sectors. Since 2020, the company has been working more than 100% CO2 neutrally.

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TECHNISCHE DATEN MAXXMILL 750

Travel and tolerances

Travel in X	750+50 mm
Travel in Y	610 mm
Corsa asse Z	500 mm
Distance spindle nose – table (min. – max. / mechanical spindle)	175 / 675 mm
Distance spindle nose – table (min. – max. / motor spindle)	150 / 650 mm
Swivel range B-axis	+/– 100°
Range of rotation C-axis (rotary table)	0 – 360°
Positioning accuracy P according to VDI 3441 *	10 µm
Positioning repeatability Ps according to VDI 3441 *	4 µm
Positioning accuracy B axis (tilting – with motor encoder)	5 sec
Positioning accuracy C axis (table – with motor encoder)	15 sec

Feed

Rapid motion speed X-Y-Z axis	30 m/min
Max. rotational speed B axis	25 rpm
Max. rotational speed C axis	25 rpm
Max. feed force X axis	5000 N
Max. feed force Y axis	5000 N
Max. feed force Z axis	5000 N
Max. acceleration X-Y-Z axis	3 m/s²

Tilting table

Clamping area	750 x 600 mm
Table-floor distance	805 mm
Slot number	5
Distance between two T-slots	100 mm
Groove wide	14 mm
Max. workpiece weight (equally distributed)	300 kg
Max. permissible workpiece weight with counter bearing	500 kg

Main spindle (mechanical spindle)

Speed range	50 – 12000 rpm
Max. spindle torque	100 Nm
Max. spindle power	15kW
Tool taper	ISO 40
Drive	direct drive

*are not broken down

Main spindle (motor spindle 15000 rpm)

Speed range	50 – 15000 rpm
Max. spindle torque	100 Nm
Max. spindle power	20 kW
Tool taper	ISO 40 (HSK-A63)

Main spindle (motor spindle 24000 rpm)

Speed range	50 – 24000 rpm
Max. spindle torque	110 Nm
Max. spindle power	26 kW
Tool taper	ISO 40 (HSK-A63)

Tool magazine

Number of tool stations	30 (40/60/90)
Tool changing type	double arm gripper
Tool management	random
Tool changing time (tool-tool)	2 sec
Max. tool diameter	80 mm
Max. tool diameter (without neighbouring tools)	125 mm
Max. tool length	250 mm
Max. tool weight	8 kg
Total tool weight supported by the magazine	100 kg

Coolant tank

Tank capacity	250 l
Standard pump pressure	2 bar
Max. capacity at 2 bar	40 l/min

Pneumatic supply

Min. pressure supply	6 bar
Min. capacity required	200 Nl/min

Lubrication

Spindle	Grease
Linear roller ways	Grease
Ball screws	Grease

Dimensions

Total height	3060 mm
Dimensions L x D without chip conveyer	2840 x 3500 mm
Weight	7900 kg

beyond standard

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