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Swiss Rotary Table Technology

NEWSLETTER

Cost-effective for fully automated 6-sided machining

T1-507510.LL



The pL LEHMANN T1-507510.LL rotary table ensures highly flexible multi-sided machining. It even allows five-axis simultaneous milling. (Images: pL LEHMANN)

Extremely efficient: Two-axis rotary table allows complete finishing of small parts in one cycle

The Tyrolean company HS Fertigungstechnik GmbH uses a Fanuc Robodrill machining center with a supplementary two-axis CNC rotary table from pL LEHMANN. This enables the company to finish small parts made of aluminum and plastic in a single operation. Thanks to robot automation, the machining center runs at a high production rate in 24/7 operation.

HS Fertigungstechnik is a service provider for machining everything from steels and non-ferrous metals to plastics and special materials such as titanium. Managing Director Sylvester Beiler emphasizes the company's wide range of services: «We have years of experience and extensive expertise in turning, milling and drilling almost all materials. We also support our customers in



T1-507510.LL TAP1 rotary table from pL LEHMANN.



Thanks to the compact design of the pL rotary table, there is still enough space in the machining compartment of the FANUC Robodrill for an additional clamping device for rear side machining.

terms of design and engineering, provide heat and surface treatments, and even undertake component assembly on request. In short, we have a very broad base and can respond flexibly and quickly to customer requirements. That is our great strength.»

To accomplish these tasks, Beiler employs 24 experienced employees who work in two shifts to complete all jobs. Nine lathes and seven milling machines are available for machining on 1200 m² of production space. «Our systems are largely automated,» explains Beiler. «This is indispensable for all batch sizes that go beyond prototypes and very small series.»

HS Fertigungstechnik serves customers from a wide range of industries, including everything from vehicle engineering –

especially rail transportation – to general mechanical engineering and aerospace. «For the most part, our batch sizes are in the four-digit range,» says Beiler. «Of course, we also produce prototypes and functional samples or take on jobs for more than 50,000 units – as long as it is economically viable.»

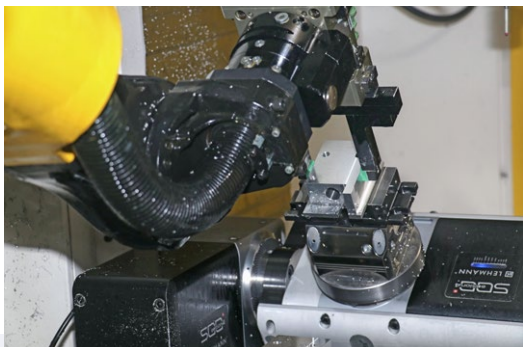
Optimized machinery for all workpiece sizes

For nine years, Beiler has been the sole managing director of the company founded by his father in 1998. By constantly optimizing his production, he has been able to achieve steadily growing success. As an example of the efficient machine equipment, he cites his three horizontal 4-axis machining centers with a pallet size of 500 x 500 mm, which are suitable for workpieces up to a maximum of \varnothing 800 x 1,030 mm. He had them equipped with 2-, 6- and 9-pallet pools. «With clamping towers on the pallets, we can operate highly flexibly depending on the job and also run automated night and weekend shifts,» says Beiler.

Three years ago, he envisioned a large 5-axis machining center with a 30-pallet system as the highlight of his production, which would serve as a universal solution for small and large parts. «That would have been a great technical solution,» enthuses the Managing Director, but then immediately puts the brakes on his own euphoria. «Then I costed everything out again. The investment costs would never have been worthwhile for our small parts production in the medium series range. And we often have those kinds of jobs of around 5,000 units. The fixture costs alone would have gone beyond what was justifiable. As a result,



With the two-axis pL LEHMANN T1-507510.LL rotary table, the FANUC Robodrill α -D21MiB5ADV 3-axis milling machine becomes a compact 5-axis machining center.



Thanks to robot automation, the Fanuc/pL LEHMANN machining center is in operation around the clock.

we would have had to utilize the production facility to capacity with large parts or large series alone, which is not feasible, at least not right now.»

Therefore, he had to give up on the plan. Beiler decided to cancel the investment in the large 5-axis machining center and instead to look for a smaller, simpler solution that could handle the range of jobs for small parts optimally. The idea arose to purchase a machine with a small footprint and without a pallet system, but with robot automation. In other words, a solution with low fixture costs, because only one clamping setup in the machine compartment is required per job. «We compensate for the downtimes caused by the robot-assisted workpiece change in the machine compartment – from an economic point of view – with the automated processes that enable the machine to run 24 hours a day,» explains Beiler.

Even small machining centers can do five-axis machining – thanks to the two-axis rotary table from pL LEHMANN

A solution was quickly found and implemented in no time at all. The responsible area sales manager at pL LEHMANN, the renowned Swiss manufacturer of CNC rotary tables, had a tip ready: A three-axis vertical machining center, equipped with a pL T1-507510.LL rotary table as the 4th/5th axis would be perfect for Beiler's purposes. «Worth considering» was the assessment of the head of HS Fertigungstechnik. «We already have a wealth of experience with such small drilling/milling centers, and we know the Fanuc Robodrill to be a powerful, reliable machine. Equipping the machine with an additional two-axis pL LEHMANN rotary table enables us to perform five-axis complete machining – exactly what we need.»

To make sure that the first impression was a lasting one, Beiler and those responsible for machining made further inquiries about machine and rotary table alternatives. Arno Schnablegger, head of the milling team, has this to say of the result: «The Fanuc Robodrill Alpha-D21LiB5ADV on offer is ideal for our small

parts machining. With a table size of 850 x 410 mm and travel paths of 700 x 400 x 400 mm, it offers enough space for the rotary table and an additional vise. The spindle with its 24,000 rpm is perfect for our light metal and plastics machining. Thanks to the fast tool change in 0.7 seconds, we achieve short cycle times, which also pays off for medium-sized series.» Beiler adds, «The fact that the machine had already been used for demonstration purposes meant that the price-performance ratio was excellent compared to new products. And we didn't have to accept any waiting times.»

Performance data match the machine

The decision was made. Especially as the pL LEHMANN T1-507510.LL rotary table was already installed as a 4th/5th axis to fit the machine. This is a two-axis, single-spindle tilting rotary table (4th and 5th axes) with clamped counterbearing. It is suitable for small workpieces up to a cube of around 250 mm. The maximum clamping torque of the 4th axis (rotary axis) is around 300 Nm, that of the 5th axis (tilting axis) around 1,100 Nm. The maximum spindle load is 79 kg (0 to 30 degrees) or 53 kg (-30 to -90 degrees). pL LEHMANN lists the indexing accuracy of the standard version at 20 and 35 angular seconds (4th and 5th axis). «With these performance data, the T1-507510.LL is a very good match for this Robodrill and offers the best conditions for effi-



With its dual gripper, the robot loads and unloads the clamping device on the pL rotary table. It also performs alignment, measuring and cleaning tasks.

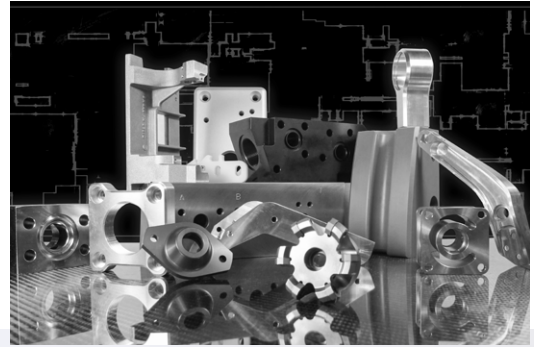
cient 5-axis machining of our small components,» Schnablegger says confidently.

Beiler agrees with this opinion and adds that this combination of machine and pL LEHMANN rotary table can even perform five-axis simultaneous machining. However, he has also identified other favorites in the pL LEHMANN portfolio: the new CNC rotary tables from the Series 900 DD, which are equipped with direct drives. Thus they allow both millturn (e.g. hob peeling) and grindturn applications as well as five-axis simultaneous machining of turbine blades or impellers. «Unfortunately, such a rotary table was out of the question for our machine. But who knows, maybe we'll find another solution in the future where we can use a rotary table like this.»

Automation for 24/7 operation

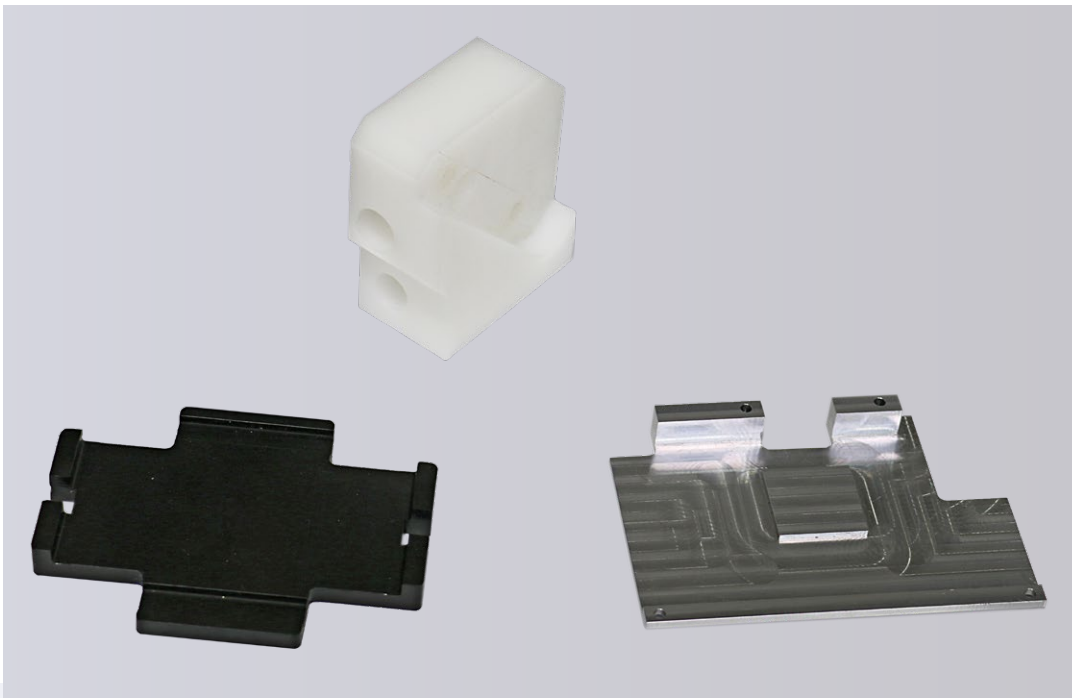
Automation was essential in order to use the 3+2-axis machining center efficiently for medium-series production. Beiler hired Cellro GmbH, based in Brackenheim, Germany, which developed an upstream cell with a six-axis Fanuc robot. «The automation specialists have succeeded in accommodating so many parts in such a small space that we are equipped for 20 to 50 hours of autonomous operation,» explains Schnablegger. The robot removes the unmachined parts from a drawer system, into which it later places the finished components. It also ensures that the parts are precisely aligned, measured and cleaned. Component clamping on the rotary table is carried out by a pneumatic centric clamping unit from Schunk, for which pL LEHMANN also supplies the required adapter plate.

«The entire automated production system works perfectly,» says Schnablegger happily. In his experience to date, the cycle times have remained short thanks to the complete machining and the ingenious change system. «On our other four-axis machines, we have to reclamp the parts at least once,» explains the milling specialist. «On the Robodrill, however, the two pL LEHMANN axes allow us to completely machine almost all workpieces in a single operation.»



A broad range: HS Fertigungstechnik supplies components from small to large made from a wide variety of materials. (Image: HS)

This means that, firstly, five sides of the part clamped on the rotary table are provided with all pockets, bevels and holes etc. in five axes. Secondly, the rear side is machined immediately afterwards in a clamping device installed next to the rotary table. «This means that the downtime during the tool change is not so significant,» says company boss Beiler. «Automation easily makes up for the loss.» Schnablegger adds: «Thanks to the reliability of the machine, rotary table and automation, we have



HS Fertigungstechnik uses the Fanuc Robodrill with two-axis pL rotary table 98 percent of the time for small parts up to 100 mm made of aluminum and plastic.



HS Fertigungstechnik GmbH is a Tyrolean company with headquarters on the Mieming Plateau. (Image: HS)

been able to keep this system running at least 16 hours a day, seven days a week since it was commissioned in July 2022. In the last two weeks, it has even been in continuous operation for over 22 hours a day.»

Professional in turning, milling and drilling

HS Fertigungstechnik GmbH is a Tyrolean company with 24 employees and headquarters on the Mieming Plateau. The steadily growing metalworking company has been working successfully in contract machining since it was founded in 1998. The range includes CNC turning, CNC milling and drilling of metals, non-ferrous metals and plastics with the highest precision in accordance with technical specifications or sample parts – supplemented by surface finishing and corrosion protection as well as assembly work if ordered.

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CNC rotary tables with Swiss quality – with indoor automation

Founded in 1960 strictly as a contract manufacturer, pL LEHMANN has been developing and producing CNC rotary tables for over 40 years. With innovations and Swiss quality, the family-owned company in the Swiss town of Bärau (Emmental) succeeded in opening up new opportunities for its customers and developing lean machining solutions characterized by high productivity through use of additional NC axes. One of the highlights of the company's history is the powerful and flexible Series 500 developed in 2009, which is ideal for the most demanding tasks thanks to its modular design. With the backlash-free, preloaded PGD gear unit developed in 2014, pL LEHMANN reached another milestone. In 2017, the company introduced innovations such as the new pL-iBox generation, which makes its rotary tables ready for Industry 4.0 and digitalized production. This was followed in 2019 by the introduction of the Series 900 DD (Direct Drive) rotary tables with speeds of up to 5,450 rpm. An additional new product, the AM-LOCK system, a special zero-point clamping system for 3-D printing, including pre-machining and post-machining, was presented for the first time in 2019. Additional innovations have followed since 2020: With rotary tables for measurement technology, pL LEHMANN is entering a new market segment. There is also a smart solution in the field of automation in the form of ROTOMATION, the slim, space-saving indoor automation product.

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