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Swiss Rotary Table Technology

## NEWSLETTER

# Spares reclamping eliminated – Improves precision and efficiency

EA-520



Maximum stability in any position: the counterbearing of the table is clamped at the same time as the drive side. It is therefore also possible to work off-center with large tools and a high feed rate without compromising precision. Images: pL LEHMANN

## Mazak machining center cuts cycle time by 30 percent with pL LEHMANN rotary table at the pneumatic system manufacturer

**SMC Pneumatik GmbH achieves a considerable efficiency increase and much higher precision by combining Mazak VC 530C 3-axis machining centers with the EA 520 CNC rotary tables made by Swiss manufacturer pL LEHMANN. And so the specialist for tailor-made electrical and pneumatic automation solutions is able to clamp up to eight workpieces simultaneously, and finish-machines them in just two chuckings.**

Based in Egelsbach, Germany, SMC Pneumatik GmbH is a company of the Japanese SMC Group and develops, manufactures and supplies electrical and pneumatic automation solutions. In addition to the distribution of SMC products from Japan, the development and production of special-purpose



EA-520 rotary table of pL LEHMANN.

solutions for German customers is an important activity for SMC Germany. These are generally ready-to-install, small automation systems supplied to the automotive, electronics, food, packing material, life science and machine tool industries. Typical batch sizes are between one and 20 – higher volumes are possible with short runs.



A small selection from the SMC cylinder range  
Images: SMC

The southern Hesse-based company machines aluminium, steel and high-grade steel to produce a broad range of components for use in automation technology, for drives or valve terminals for example. As the product range grows, so do the demands on the tolerances. Consequently, SMC Pneumatik was facing the problem that the required accuracies cannot be realized when workpieces are repeatedly reclamped in pre 3-axis machines. Costs also came under increasing pressure. The aim was to find a solution for an economically-acceptable investment, which is able to achieve both high precision and short machining times.

### Good experience with the fourth additional axis

Head of Production Marius Pulter and Markus Prokopp, Head of Machining at SMC soon hit upon the ideal solution. Back in 2012, they expanded a 3-axis machine from DMG with a pL LEHMANN rotary table by a fourth axis. «This enabled us to achieve a high degree of accuracy, and our experience was good in every other way», reports Pulter. And because this requires only one reclamping per workpiece, the setting effort was also reduced.

And so those in charge took the decision to purchase two new Mazak 3-axis machines, which they had factory-fitted with an additional rotary table. Due to the positive experience with the first pL LEHMANN table, there was no question over who would manufacture the fourth axis», reflects Markus Prokopp. In terms of investment costs, this was also clearly the right solution: «A pure 4-axis machine with comparable efficiency would have been at least 20 to 25 percent more expensive», explains Marius Pulter.

The «3+1» solution was favored for other reasons too. 4-axis machines usually require more space and consume more energy. And especially in companies that want to install a machine on the first floor or even higher, the weight advantage of the 3+1 solution also plays a key role.



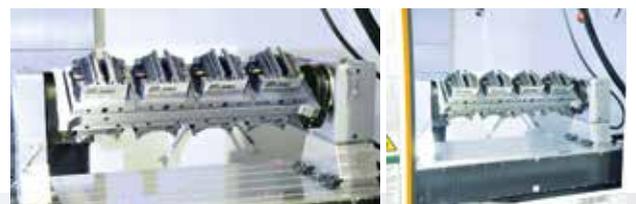
3+1 axes – a successful combination: At SMC, the Mazak machining centers equipped with pL LEHMANN rotary tables achieve a significant efficiency increase and high precision. Images: pL LEHMANN

Following a detailed analysis of the specific requirements with IVO Oesterle NC-CNC Technik Vertriebs GmbH, which had already retrofitted the DMG machine with the pL LEHMANN table, the decision was made for the EA 520 pL LEHMANN rotary table. For over 20 years now, IVO Oesterle has been the German distributor for Swiss rotary table manufacturer pL LEHMANN, and also handles the service work.

### High expectations were exceeded

Once the machine had been commissioned at SMC later in summer 2015, it soon became clear that the decision for the Mazak/pL LEHMANN combination had been dead right. «We were hoping the new solution would deliver major improvements – but our expectations were exceeded», says Marius Pulter on balance. The cycle times were cut by over 30 percent. «We are able to clamp more parts and achieve higher levels of precision, the requisite holding forces exist, there are no vibrations – we are absolutely delighted», confirms the Head of Production, summing up.

This is the result of a joint effort involving not only Mazak, pL LEHMANN and Oesterle, but also SMC and a clamping system manufacturer. Between the rotary table drive and the counterbearing, there is a bridge, developed by SMC itself. When combined with the correct clamping system, this bridge is able to accommodate up to eight workpieces at the same time and these are then machined in succession without any workpiece change. This considerably increases machining efficiency. And despite that, the required precision in the tolerance range of IT 6 and IT 7 is effortlessly achieved.



Multiple-clamping: Combined with the correct mounts, the bridge between rotary table and counterbearing built by SMC permits the multiple-clamping of up to eight workpieces in the second run.

The EA 520 rotary table's strengths include the high clamping force of 2000 Nm, which is realized pneumo-hydraulically. An important factor for stability is that the counterbearing is clamped at the same time as the drive side of the table. The result is high rigidity at every point on the bridge, as Markus Prokopp confirms: «We are able to work with large drills and a fast feed rate, even off-center, without the spindle clamp yielding.»

### High-pressure cooling lubricant is no problem either

SMC uses the Mazak machining center with the EA 520 to also drill small, deep holes. As Head of Machining Prokopp explains: «Our Mazak machines are equipped with powerful coolant pumps that generate up to 40 bar of pressure. Since the EA 520 pL LEHMANN rotary table satisfies the requirements of Protection Class IP67, we are able to use all this power to produce workpieces that were previously impossible.»

SMC achieved all these benefits without any restriction to the capabilities of the machining center. The design and the relatively small space required by the EA 520 ensure that the travel permitted by the machining center can continue to be fully used in the X-axis.

Additional key data for the EA 520: With a tare weight of 57 kg, the spindle load can be a maximum of 400 kg without counterbearing and 800 kg with counterbearing. The spindle clamp has a holding torque of 2000 Nm and a pull-out torque of 3900 Nm. The maximum feed torque is 440 Nm and the maximum spindle speed is 50 rpm.



Valve terminals (left) and cylinder housing are among the components that SMC Germany produces on the Mazak machining centres equipped with pL LEHMANN rotary tables at optimized efficiency and with a high degree of precision.

That the Mazak / pL LEHMANN combination worked without problems from the outset is also down to IVO Oesterle NC-CNC Technik Vertriebs GmbH. Even in the run-up, it was important to find the table best able to meet SMC's requirements and to individualize the table if necessary. As Managing Director Markus Oesterle explains: «Certain key data have to be respected. Our remit included analyzing the clamping fixture and the workpieces in advance, and also considering those that might be integrated in the future.» Key questions here include: Are the fixtures constructed centrally or eccentrically? Which weights

have to be moved? What are the required cycle times? How accurate do the workpieces need to be?

### Integrated sensors simplify maintenance

Once a suitable table is identified, Oesterle collaborates with the pL LEHMANN experts on further application engineering, to adapt the motor rating for special weights or cycle times, for example. «All this is done in advance with the machine supplier. If the machine and the table arrive together, all the customer should need to do is turn the key and start-up», says Markus Oesterle. Markus Prokopp is happy to confirm: «That's just how it was with us.»

Another important aspect for the user is the optimum availability of its production systems. That's why pL LEHMANN equips the rotary tables with sophisticated sensor technology, which records the most diverse status data and ambient conditions. If a malfunction occurs, the user is shown in simple cases where the cause lies and how it can be rectified. If the malfunction is of a more complex nature, the customer service experts at IVO Oesterle use the data, which can be read-off via USB interface, to carry out a remote diagnosis. «This way, we can solve certain problems very quickly in a telephone call without the need for time-consuming and expensive service visits», emphasizes Oesterle. SMC has not yet been able to benefit from these features. As Marius Pulter can say about his rotary tables: «They are like the VW Beetle used to be: They just keep running ...»

## Special-purpose solutions from Egelsbach

With a market share of 34 percent, the SMC Group, headquartered in Tokyo, is the world's leading provider of electric and pneumatic automation solutions. In Germany, some 700 employees are engaged at SMC Pneumatik GmbH in Egelsbach either in selling SMC products or in developing and producing special-purpose solutions. In addition to the special-purpose products, the SMC range comprises around 700,000 different versions of 12,000 basic models. Including electric and pneumatic drives, valves and valve terminals, air treatment systems, cooling and temperature control units, ionizers, process pumps, instrumentation, fittings and hoses. In Germany, approximately 35 percent of total sales, which exceed 100 million Euro, are achieved with special-purpose solutions. Worldwide, SMC generates sales of around 3.6 billion with some 18,000 employees

## Key benefits of a 3+1 axis solution

Vertical 3-axis centers with mounted rotary table often represent an advantageous alternative to four-axis machining centers. They are impressive in terms of accessibility, space and energy consumption and require little investment. The reasons are good ones. This kind of 3+1 axis solution is able to realize multi-component/multi-sided machining much more easily. This is because clamping towers or bridges can be integrated into the additional axis, whereas the swiveling or rotating table configuration on 4-axis machines poses a greater risk of collision. The masses to be moved also constitute an important plus point for the 3+1 axis solution: While a 4-axis machine has to accelerate and decelerate the entire machine table, including fixture and workpiece, with a mounted rotary-axis system, only these rotary axes move together with the fixture and the workpiece, i.e. considerably smaller masses. In addition, mounted axes offer the fundamental benefit of being removable. If three-axis machining suffices, the entire machine area can be cleared for large, bulky workpieces.

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