INTELLIGENT VALVE SOLUTIONS FOR THE SEMICONDUCTOR INDUSTRY
AUTOMATED PROCESS CONTROL IN CLEANROOMS

In the high-complexity world of semiconductor production, millimetre precision and reliable process control are indispensable. Our success story focuses on a leading world-wide manufacturer of innovative solutions in the area of advanced process control – a solidly established customer of GEMÜ that nevertheless has mainly ordered products from the GEMÜ standard range up to now.

During the production process, a silicon wafer passes through multiple chemical baths. In these baths, concentrations and temperatures must be kept at a consistent level. The continuous monitoring and analysis required for this is implemented via a sampling process. Over time, the chemicals begin to run out and the concentration is reduced – which is where a "topping up" process comes into play. This process involves feeding in the necessary components again. This is precisely where the GEMÜ valve comes into play. A valve is used for each medium mixture or each basin.

The customer has developed a state-of-the-art PC-based analysis and automation system, customised for the semiconductor industry. This fully automatic system enables real-time monitoring and precise topping up of process fluids, galvanic electrolytes and cleaning baths. This means that the expensive laboratory process is no longer needed. The system is located in a cleanroom and plays a crucial role in the production of microchips.

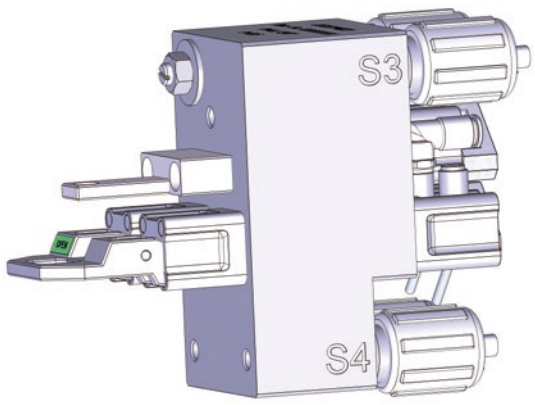
In the past, the customer relied on an extremely laborious and expensive pinch valve of their own design. GEMÜ worked together with the customer to develop a substantially easier and more efficient solution that brought together all the requirements in one valve. The process reliability also needed to be increased. Speed was important. The customer wanted to move into the implementation phase as quickly as possible.

Maximum efficiency in the smallest of spaces

The task was clear: Designing a compact valve block with 3/8" pillar connections and a total of five GEMÜ C50 and C51 iComLine actuators of actuator size 0A1 with a maximum size of 50x100x80 mm. The special feature of the design is that it should be possible to close both manual valves at the same time with a single lever.

But why was this specifically so important to the customer? The lever acted as a safety circuit. If the lever was turned and both GEMÜ C51 iComLine valves closed, the system was shut down. With a conventional hole, the lever would always be at 90 degrees from the system. GEMÜ went one step further and changed the hole and therefore the NO position of the hand lever to prevent the system being shut down unintentionally.

The speed of the GEMÜ experts was a clear benefit. They were able to present an initial valve block design within just two days. After a few adjustments, three valve blocks were supplied for testing, one of which was immediately subjected to endurance testing at a large international semiconductor manufacturer. These tests were successfully completed within a very short time and approved by the end user. This enabled GEMÜ to stand out from the competition. However, further development of the valve block was not to end there.



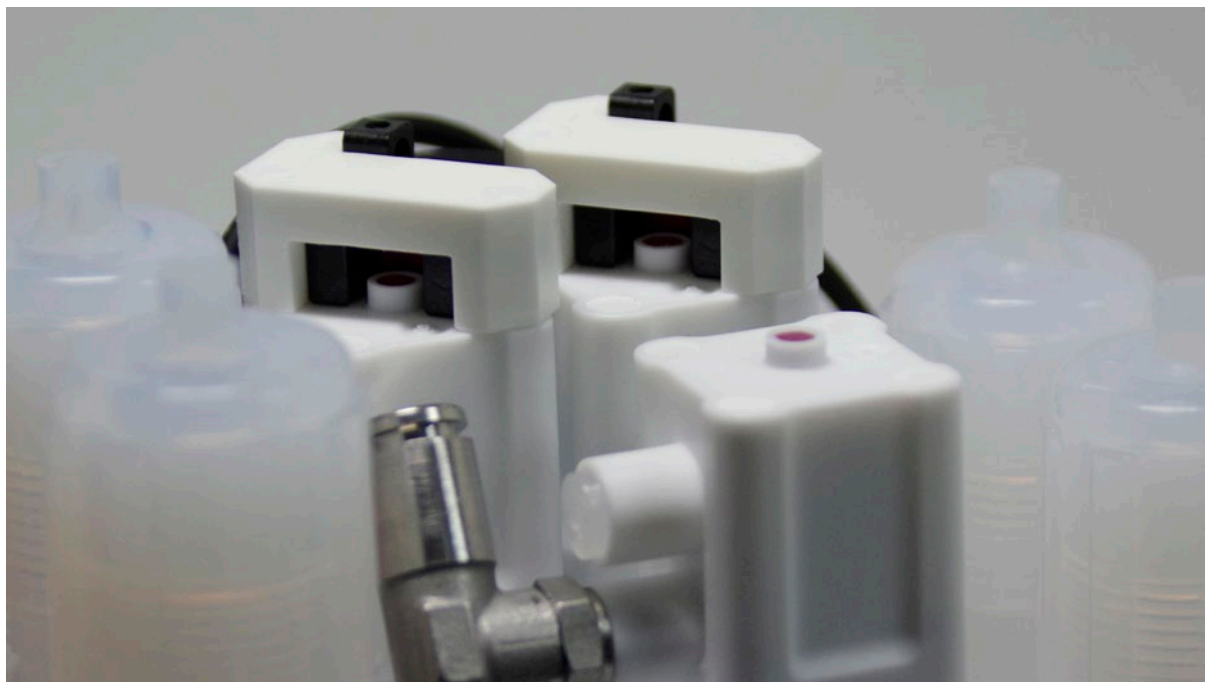
Before: Single lever in NO position at 90 degrees

Before: Single lever with modified hole, NO position upwards

The key to fine adjustment

The wide variety of pressure requirements in the end user's systems required the integration of an additional needle valve in the valve block. In close and above all direct collaboration with the customer, a needle valve was developed within a few days and was also integrated into the block valve. The tests performed on the valve block by the customer themselves were successful, to the complete satisfaction of both the customer and GEMÜ.

The end user also substantially benefits from the increased process reliability and the user-friendly operation of the valve, which in turn results in even more precise manufacturing.



In addition to the custom developments already performed, the final customer requirement was to implement an electrical position indicator on the GEMÜ C50 butterfly valves. GEMÜ C12a, an optical light barrier, proved to be the ideal solution.

The success speaks for itself – on both sides

Development of this special valve block was a challenge. As always, GEMÜ demonstrated exceptional flexibility and innovation. The sample valve blocks have already proved the reliability of the GEMÜ solution. The success factors were quick response times, geographical proximity and above all direct communication. Approx. 1000 of these valve blocks have been purchased to date.

The GEMÜ valve solution is a replacement for the customer's expensive in-house design and enables substantial space savings. The installation time has been significantly reduced, and it is easier to operate. The compact design has eliminated several installation steps. All of these improvements have resulted in significant cost reductions for the customer.

This success story reflects the versatility and innovative capacity of GEMÜ. It demonstrates that custom and complex solutions can also be developed specifically for applications where there is limited space available. Valve combinations involving other plastic materials or stainless steel for pharmaceutical applications are also possible. This makes GEMÜ the ideal partner for a promising future.