

Motor spindles of proven quality for machine tools

When a company unifies all of the skill sets of all of its divisions to develop a new product, the result can really only be something truly special. This is precisely what happened in the development of the test stands for the comprehensive testing of motor spindles for laboratory (SL100) and serial production use (SE100), the fruit of collaboration between the specialists from the Test Engineering, Measuring Machines and Measuring Components divisions.

Since its foundation back in 1968, Blum-Novotest GmbH has worked closely with the machine tool industry and its manufacturers. The company supplies manufacturers and end customers around the world not only with workpiece probes but also with products such as high-precision laser measuring systems for tool measurement. In recent years the motor spindle in particular has continued to gain prominence in this area as a core component of machine tools. These are frequently produced by machine manufacturers themselves in order to allow particular features to be incorporated, thus ensuring competitive features in a highly competitive market. As a key component of any machining centre, the spindle is essential for the quality of the machine and the workpieces that it produces.

The idea for a new product was born as the persons responsible at Blum-Novotest realised following relevant analyses that there were in principle no standardised test stands for the reproducible and comprehensive testing of motor spindles. Previously, manufacturers as well as service companies who overhaul such spindles would use test stands from a machine constructor or stands partially constructed in-house in order to test the quality of motor spindles. These new spindle test stands aim to serve this market gap.

At EMO 2017, Blum-Novotest presented the idea for a spindle test stand for the first time to the professional world in the form of a prototype, and it was very well-received. This encouraged Blum-Novotest to pursue this idea further and to bring it to serial production. "We have been developing and constructing gear test stands for the global automotive industry for 30 years, and we quickly noticed that the requirements here were very similar to those of spindle test stands," said Alexander Blum, President of Blum-Novotest GmbH. "So we combined this know-how relating to our measuring components and experience from the measuring machine segment to create an entirely new product."



Spindle test stands are generally a compelling proposition for four different sectors: machine tool manufacturers (some of whom manufacture their spindles themselves), motor spindle suppliers, spindle repair services and maintenance divisions of companies with large production machinery inventories. Manufacturers of machine tools and spindle manufacturers value the ability to test the quality of motor spindles under real-world conditions before shipping and when developing spindle tests. After all, premature failure results in high warranty costs and can be damaging to reputation. It is also in the interest of the user for potential failures to be avoided, because this can also become very costly. While motor spindles are themselves very expensive, the costs involved in dismantling and installing the spindles and production stoppages lasting several days can exceed these several times over. For spindle repair services and maintenance divisions, it also follows that the results of a repair should be tested before commencing the complex process of re-installing it in the machine.

Laboratory test stands on the other hand are required for the development of spindles that allow spindles to be driven to and beyond their limits so that their limits can be documented in practical use. This means that laboratory test stands are constructed differently to serial test stands. Spindles on laboratory test stands for example are exposed to forces comparable to those used during machining. On a serial test stand, by comparison, the spindle is allowed to run freely with no applied torque load. This is why Blum-Novotest has two models in its portfolio: the laboratory test stand SL100 and the end-of-line test stand SE100.

The greatest advantages of the test stands are due to their complex sensor technology and user-friendly testing software, which controls the test stand and test processes and reacts to sensor inputs. This interaction is important in tests where input factors such as the spindle temperature dictate how the test is performed, for example. The breadth of values and test processes possible on Blum-Novotest's test stands is large and ranges from the detection of speeds and vibrations to torque values, temperatures and flow rates. These complex test processes and analysis options require a substantial amount of know-how to provide perfect results, know-how that Blum-Novotest has gathered through decades of experience in the construction and operation of gear test stands, know-how which they have also implemented in their software.

Blum-Novotest optionally also equips its spindle test stands with the LC50-DIGILOG laser measuring system developed by the Measuring Components division. This system has otherwise primarily been used in machining centres. The system detects vibrations using non-contact methods on the test stand or determines the run-out of the rotor shaft relative to the calibration pin, as would be done on the machine tool itself later on. These measured values (spindle ID) from the serial test stand can be referenced later where necessary on the machine tool in the course of preventative maintenance. If a spindle has been tested on a Blum-Novotest test stand prior to being shipped and the LC50-DIGILOG laser measuring system is installed in the machine tool, it is even possible to compare any current state against the state upon shipping. After all, properties such as the run-out characteristic are already analysed on the test stand using the high-end laser measuring system. This allows spindle performance to be documented throughout the entire product life cycle.



The reproducibility of the tests is also important, as Head of the Sales Division Peter Möhle explains: "If a manufacturer has production ongoing at several locations, for example, test processes can be set up centrally and distributed to the test stands of the various branch sites – allowing test processes to be reproduced, automated and standardised. This ensures that results are always comparable, regardless of where and by whom the tests have been performed."

The test stand software provides a convenient solution for users that allows customised test interfaces to be created by simply dragging & dropping elements. Indicator bars together with limit values can be created with just a few operations. For example, different spindle series with different performance specifications can be defined using the same test process with different type parameters – allowing a customised test process to be created quickly for each spindle type.

The software stores the results of each test run as an XML file that can be imported into any measurement data analysis software.

There are several advantages to having the test stand software store and document all test values. Firstly, the manufacturer or service provider can provide the customer of any given spindle with an individual test log that can be identified based on the serial number. Secondly, it remains possible to access the test values of a given spindle even years down the line. Finally, it enables a knowledge base to be developed over years that documents the experience of the test stand operator.

"The software is the core of our solution. We developed a software solution in collaboration with the automotive industry over the course of many years that is easy to use while also allowing for very complex analyses," summarised Alexander Blum. "We have now applied this wealth of experience to the spindle test stand, enabling us to offer our customers a very mature package, even if the 'spindle test stand' itself is actually a very new product. This is due not least to the knowledge of all three divisions being merged into a singular whole, resulting in this product. This makes me especially proud."