The NOVA M12 Grinding Machine: Greater Precision and Speed with Simplified Architecture

For its new NOVA M12 system, MECCANICA NOVA, a leading manufacturer of grinding systems worldwide, implemented sercos as the universal bus for the entire automation, combining its precision and speed with systems from Bosch Rexroth. More flexible, quicker and easier, the third generation of sercos improves the overall production process with its innovative machine philosophies.

For over 70 years, MECCANICA NOVA has been a world leader in the design and implementation of internal and external grinding systems for various industries and products: in automobiles, aeronautics, geared motors, standardized speed-change drive units and bearings. The Bologna company acquired its earliest expertise in the area of grinding of bearings thanks, in no small part, to the support of a multinational partner, the German Schaeffler Group.

The company offers a wide range of machines for internal, external and combined grinding of parts ranging from 5 mm to 1000 mm.

MECCANICA NOVA's uniqueness can be attributed to its long-term success in creating customized solutions based on customer requirements, as Massimo Martina, MECCANICA NOVA's CNC software developer, explains: "Our machines start out as standard solutions but are then customized to meet individual requirements – so that no two are ever the same. The customer asks us to meet certain technical specifications and we must remain highly flexible in order to do this."

Besides flexibility, the company targets innovation, which it optimizes by combining electronic and mechanical technologies with the primary goal of enhanced machine operation. MECCANICA NOVA is thus able to offer sound technical solutions that solve a variety of production issues. The products are equipped with cutting-edge technology and offered at fair rates.

MECCANICA NOVA's grinding machines offer a high production output with very short cycle times for machining.

MECCANICA NOVA manufactures its own numerical control and installs it on the machines, which is the secret behind the high performance and speed of its electronics. "Thanks to the consolidated experience and collaboration of innovative partners such as Bosch Rexroth, a company that is synonymous with reliable, high-level components, we can guarantee a rapid execution of programs," explains Martina.

Bosch Rexroth has been supplying the Bologna based company with the components to control the first generation of the sercos communication interface since the year 2000. All machines with this solution installed will be upgraded to the third generation of sercos starting in March and April of next year. The first machine to have undergone this upgrade is the M12, the NOVA numerically controlled grinding machine for combined grinding work on inside diameters, outside diameters and front surfaces with separate grinding wheels, intended for the universal machining of gearbox components in the automotive industry.

"The challenge is to integrate our sercos Ethernet board in the NOVA numerical control architecture while maintaining and guaranteeing top performance in terms of the speed and precision required of the machine," explains Dario Dallefrate, product control manager at Bosch Rexroth Italy.

MECCANICA NOVA has greatly appreciated the infinite potentials of the third generation of sercos. First of all, this solution simplifies machine architecture thanks to reduced hardware: it has gone from two boards to just one. The number of drives that can be actuated without the installation of an additional board was also increased. "We now have up to 24 drives compared to 16 in the previous solution," Martina points out. "Once again in relation to the simplified architecture, with the third generation of sercos we have done away with optical fibers and also reduced the wiring by opting for an Ethernet cable."

As an additional positive feature, we have eliminated the old board that required programming using external software since the new Bosch Rexroth Sercans03 board is programmed directly by the Nova CNC. This is especially an advantage when it comes to spare parts: service personnel no longer have to reprogram the board manually if it needs to be replaced.

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With regard to speed, although the first generation of sercos was very good in this respect, the latest generation is even better. With the third generation of the sercos Motion Control profile, it is now possible to whittle sampling cycle times down to 0.5 milliseconds. This time determines machine performance, i.e. the machine has become even more precise.

Besides the Motion Control profile, the communication profile – for I/O device management – and the profile for the safe transmission of automation data have also been developed on the third generation of sercos. The latter profile, as Dallefrate tells us, "is called sercos Safety and has been implemented in view of the safety standard that will take effect in 2012. The CNC must be able to safely transfer data. The communication channel, i.e. the field bus, must therefore be equipped with this capability: not only to enable data to reach its destination within the time specified, but also without any alteration of its content in order to prevent any safety hazards to operating personnel."

MECCANICA NOVA plans to transfer these profiles inside the bus, which would allow an even greater streamlining of the control architecture, eliminating components from the electrical cabinet. None of these measures will decelerate the communication involved in controlling the Motion Control since MECCANICA NOVA is consistent in its pursuit of speed and accuracy.

This high level of accuracy is one of sercos' strong points. "The synchronicity of the sercos bus allowed MECCANICA NOVA to create the M12, a grinder with excellent machining precision," adds Giovanni Cicala, the Bosch Rexroth application technician. "When we have several axes and several motors that have to move in coordination, the drives must actuate the command for what needs to occur simultaneously. The control unit first transfers the data to the drives and then gives a signal to work in a synchronized manner, all very rapidly. This is also because these machines have to guarantee accuracies to the order of a micron for final machining and a tenth of a micron for positioning axes." The result? With the Rexroth drives, MECCANICA NOVA achieves positioning accuracy to a tenth of a micron!

Besides sercos III, the NOVA M12 is equipped with 7 electric Rexroth Indradrives that are used to position the axes and the spindle. The new generation of high frequency Indradrive HFs is used for the grinding wheels. These Indradrives feature safety on board functions with the new IEC61800 certification conforming to the Machinery Directive. MSK brushless electric motors are used on the NOVA M12.

"Our success is the result of teamwork through our support for Rexroth technology with its sturdy mechanics and Rexroth's guarantee of reliable products. Besides all the advantages listed here, we are confident that sercos still has a lot more to offer in terms of potential, which we will be implementing in the following months on the machines to be converted to this new technology. With Bosch Rexroth we have found a partner that has always stood by us, that is flexible in meeting our requirements and always ready to work on a new "ad-hoc design!" concludes Martina. ■

S More Informations

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