DEPRAG NORTH AMERICA
Screwdriving Technology
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Press Release

Using the right technology to fasten miniature screws to the frame

Sunglasses provide a clear view

DEPRAG focuses firmly on innovative technology for micro-assembly operations

Anyone looking to apply innovative technology ventured to the MOTEK 2011, which was held this past October, where DEPRAG's focus was on modern micro-assembly operations - and ground-breaking new products were on display. Trendy sunglasses were assembled live before visitors' eyes. At a single glance, visitors to the exhibition were able to obtain a logical overview of how fasteners - barely visible to the naked eye - are assembled using a process-reliable method. Screwdriver, process controller, screw feeder, position control stand, electronic measurement and the DCOS controller concept - everything on this semi-automatic assembly station was designed towards miniaturization. Whether the task is to assemble a hearing aid, a pacemaker, a GPS unit, a cell phone or fashionable sunglasses - micro-assembly can be process-reliable but only by applying the utmost attention to detail. Tiny fasteners can create gigantic problems; so observant engineers take a long look when it comes to designing equipment to handle micro-components.

DEPRAG SCHULZ GMBH u. CO. from Amberg, Bavaria is well-known as a One-Stop-Shop for sophisticated designs for the automation industry. Industrial miniaturization is a huge challenge for many plant engineers. DEPRAG continues to impact the assembly-industry with innovative products and by enhancing its existing product lines.

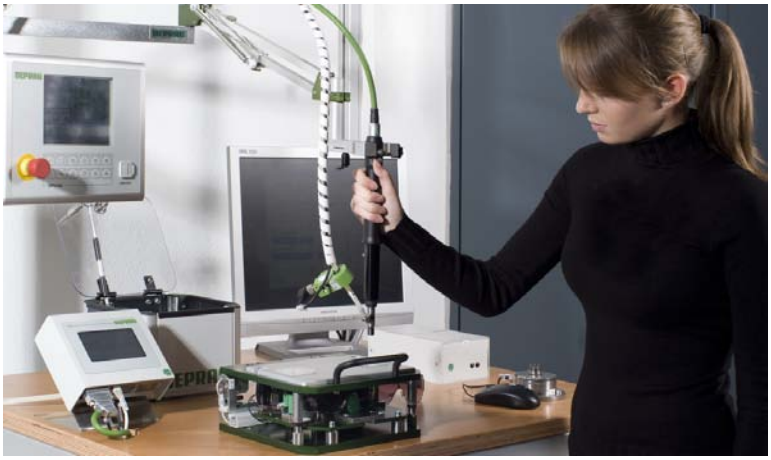
We had to focus on the screwdriving task in hand. The arms of the sunglasses are fastened onto the frame with tiny screws. A MICROMAT®-EC screwdriver from the DEPRAG screwdriver line - proven a thousand times over - does the job. The screw tightening torques are freely programmable for this extremely compact, flexible screwdriver - the size of a ballpoint pen – and it is designed to meet maximum industrial demands. Torque, rotational angle, speed, stand-by time and direction of rotation can be programmed individually for each screwdriving task. The stationary DEPRAG EC-screwdrivers are distinctive for their high torque accuracy and they also possess comprehensive monitoring/control functions for an optimal process-reliability. The MICROMAT®-EC screwdriver is equipped with a brushless, extremely low-maintenance EC-motor that guarantees a long service life. The highly-accurate torque analysis using the motors current, along with an exact angle of the rotational measurement, enables the accurate control of the screw tightening process and records all pertinent parameters.

Download the MICROMAT®-EC catalog.

The EC screwdriver is controlled by the new DEPRAG AST5 screwdriver controller, which was also introduced to a wide audience of industry professionals at the exhibition. It is the ideal process controller for carrying out manual screw-assembly operations with the DEPRAG EC-screwdrivers of the NANOMAT®-EC (future product) and the MICROMAT®-EC series that covers a torque range of 0.08 to 80 Ncm.

Download the AST5 Controller catalog.

At first glance, one notices the small and versatile design of the new AST5, specifically devised for micro-assembly operations. It will fit on any manual workstation, even where space is at a premium. Produced to correspond to the typical, clearly-defined DEPRAG design, it is operated via a user-friendly touch screen. The process controller contains standard screwdriving programs to assemble components to torque and to loosen them to rotational angle. The parameter can be adjusted - to the job at hand - directly via the touch screen. User-specific screwdriving programs can be quickly and simply compiled using the embedded program commands as a platform. The AST5 can hold up to 100 user programs, which can be quickly recalled via the color TFT display unit. Users select individual user profiles either by typing in a program number or by recalling the name of the program, which was preset by a user. The programs can be configured and the control functions recalled via a standard web browser or directly on the touch panel display. Separate PC software is not required.



The new AST5 controller records the cycle results from the previous seven production days, and stores them for retrieval via the Ethernet connection. Additional advantages are the detailed graphical-display of the screwdriving curves, the integrated PLC-functions, as well as comprehensive analysis options. This ensures the successful traceability of the production steps, along with an optimal quality-management process.

Furthermore, the AST5 provides the option to be combined with an automatic screwfeeding device. It is one thing to assemble such small screws within a reliable process, but quite another to automatically separate and feed them repeatedly to the screwdriver in a precise rhythm. DEPRAG introduces another innovation: The DEPRAG screwfeeder for micro-assembly operations, with a fill-capacity of just 0.05 liters!

Miniaturization of fasteners poses a difficult task for the autofeed process. When the subject screws are extremely small, the vibratory bowl contains a mass of components that cause problems during the process due to the shifting load. Proportionally wide vibration amplitude is necessary to set the parts in motion. On the other hand, each screw as an individual is very small and light-weight, and if the vibration amplitude is quite large, the individual screw will react with excessive motion. That makes it difficult to control and separate the fasteners. The new DEPRAG feeder for micro-components overcomes this problem by the use of Piezo technology. A high-frequency Piezo drive moves the 0.05 liter vibratory bowl with very delicate vibrations. These regulated vibratory movements help to transport and align micro-sized components - as small as the head of a needle – and get them ready for separation. The frequency range of 60 to 400 Hz can be precisely regulated.

The screwdriver and automation expert, DEPRAG, always has an eye on the process reliability aspect of its systems. The manual workstation is equipped with a position control stand (PKS). This tool support-stand ensures that the screwdriver is always guided perpendicular, which is essential for the assembly of miniature screws. The stand also absorbs the screwdriver's torque reaction, making the process more comfortable for the operator. But, the position control stand does even more than that! If the work involves several screw positions, it is possible to use the PKS together with a suitable controller, to specify and control the sequence in which the individual screws are driven. The controller contains a host of functions to govern the entire manual assembly-process. This may include the clamping and lock-down of the parts, the feeding of fasteners, or the triggering of some necessary measurement functions. Every measurement result can be stored or transmitted to a database using a TCPIP module.

Download the PKS (Position Control Stand) catalog.

Industrial precision screwdrivers such as the DEPRAG MICROMAT® achieve extreme high torque accuracy. They achieve a CmK value greater than or equal to 1.67 plus/minus a tolerance of 10% in relation to the 6 Sigma methods according to ISO 5396. In other words, a CmK value of 1.67 signifies an error rate of just 0.6 errors per one million screwdriving operations. This makes the MICROMAT® suitable for applications where safety-relevant screw joints need processing, such as in the medical industry. It is in such fields that the regular verification of the screwdriving process is of vital importance. What simply may result in scrap material or rework when assembling sunglasses, could prove fatal in the performance of a medical device because of loose or incorrectly assembled screws. This is why industrial screwdrivers are checked and recalibrated at regular, specified intervals. Calibration checks can be performed directly during the assembly process, using manual measuring instruments, without the need to remove the tool from the workstation.

Visitors to the show were also drawn to the DEPRAG measurement equipment, which forms part of the One-Stop-Shop philosophy: The new ME6000 electronic measurement system is one of the finest torque-instruments currently found on the market, With the ME6000 the DEPRAG portfolio of torque measuring instruments has been expanded by adding this high quality precision measuring instrument, which achieves double the measurement accuracy of the tried and tested ME5400. It is recommended for use anywhere where a measurement accuracy of 0.5% is required. This is an absolute necessity for torque values of less than 0.5 Nm. Especially in a miniature-assembly area where it is necessary to work with the lowest possible torque-values, the screwdriving result can be displayed as a torque-curve and the screwdriver verified in regards to its accuracy. This allows us to achieve advancement in the area of quality-control for such difficult applications.

Download the ME600 Torque-Measuring Instrument catalog.

The host controller for the sunglass assembly station is based on the DCOS (DEPRAG CONTROL SYSTEM), an innovative equipment and process control system at the highest industry level. It contains a whole list of benefits in regards to traceability, documentation and archiving the production process (PLC). Current product liability legislation takes action against manufacturers in the event a faulty product reaches the retail shelves. So, who is liable if the end product was manufactured using several components? To answer this question, it must be possible to provide production traceability.

Download the DCOS-Controller catalog.

The DPU100 operating unit can be connected via an EtherCat port to the company's Network/Intranet/Internet system. Integrated network capability, problem-free connection to SCADA and MES systems, optimum data management and storage, and above all, access to common PC-applications such as browsers, data backup and remote access, allow an almost limitless application possibility.

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