

## Press Release

Quality management for automation begins with the selection of the stationary screwdriver.

### The right tool for a zero-reject rate production!

Electric- or Air-Tool? What criterion determines the type of drive that should be used in production?

The achievement of zero-reject production rates has the highest priority in the industrial assembly process. Time and again we hear of product recalls due to defective screw joints. The associated material damage and loss of brand image is dreaded by every industry. And when it relates to safety-relevant components such as in the automotive industry, then the manufacturers make every conceivable effort to ensure maximum process reliability throughout the installation process. Selecting the correct tightening tool for an industrial mass production is the cornerstone to achieve a high-quality and zero-reject production system.



A threaded fastener is intended to clamp components together so that external forces cannot cause them to come apart and all parts essentially behave like a single unit. The designer calculates how high the applied clamping force must be so that the assembled component can withstand the most demanding mechanical stress. However, the question is whether the predetermined clamping force is achieved correctly during the tightening process. The trickiest problems in regards to screw driving are unknown variables related to the seating of the fastener and material composition.



Since the clamping force generated is difficult and expensive [if feasible at all], the applied torque and angle are accepted as the predominant process in the screw driving technology. The more precise an industrial screwdriver applies the predetermined torque or angle the more likely it is to achieve a zero-reject screw/bolt assembly.

There is no universal answer to the much debated question on the most appropriate drive for an automatic screwdriver spindle. The correct answer lies in finding the best screwdriver for each particular application. Full service providers

such as DEPRAG SCHULZ GMBH u. CO. in Amberg, Bavaria offer both: pneumatic screwdrivers and screwdrivers using EC-Electric motor technology. DEPRAG has made its name by offering technically advanced and economical stationary screwdriver spindles.

DEPRAG staff members competently advise their clients in choosing the proper screwdriver for the required task. Gerd Zinn, Manger of the DEPRAG R & D department for production machines, quotes an example: "Stationary screwdriver spindles with an EC-drive from our MICROMAT-EC/MINIMAT-EC product line, are always particularly suitable when it comes to achieving and documenting different tightening torques or sequences in one assembly system., due to their low maintenance brushless EC-motors "

The brushless electric motors which DEPRAG has developed for its screwdriver spindles are practically free of wear parts and therefore guarantee a long service life. The EC-motor is able to deliver a high torque even at low speeds. With its compact, slim design and high energy density it is ideally suited for the demands of seating threaded fasteners.

The DEPRAG EC-screwdriver technology is available in two versions: For programmable screw tightening there is the MICROMAT-EC Servo Spindle and the MINIMAT-EC Servo Spindle. Both are equipped with an integrated direct measurement system and cover torque ranges from 0.2 to 500 Nm [1.8 – 4,425 inch pounds]. An EC Servo Screwdriver spindle is used in applications with high safety requirements (critical screw joints), where a direct measuring system is specified. The associated AST30 sequence controller can easily be operated by an industrial PC or PLC. From here the required parameters are selected for each

fastening application to be used during the assembly. In automatic mode the device is controlled via the PLC or an industrial PC system.

It is possible to apply a number of different torques and or angle sequences in one assembly cycle, for example, if a fastening application requires the screw to be tightened in a two steps cycle. In this case the screw is first applied with full speed at a low pre-tensioning torque. This is followed by the second step with reduced speed for the final tightening torque. Monitoring the rotational angle further enhances the accuracy of the results. The tasks stored in the AST30 are sequentially processed. The strain gauge transducer integrated in the MICROMAT-EC Servo/MINIMAT-EC Servo determines the tightening torque, which is documented for process control by quality management.

The second version is the MICROMAT-EC/MINIMAT-EC, without Servo. It is operated by the programmable sequence controller AST10 - which can be programmed by the operator directly from the controller's keyboard - by utilizing an embedded software and/or any PC equipped with a web browser and an Ethernet port. The stationary screwdriver spindle carries out the programmed process by referring to specified tightening parameters, which can be build-up from four basic programs. The AST10 also facilitates the monitoring and documentation of each joint.

A functionally reliable system can be quickly and easily created from individual EC-spindles and their respective controllers. The DEPRAG standard **Screwdriver Function Module (SFM)** handles the drive stroke for automatic assemblies, both in single or multi-spindle configuration. This automatic screwdriver slide (SFM) is designed to be mounted to any substructure. So, a DEPRAG staff member can quickly determine the model, which is most suitable for your particular application, by selecting from a large variety of available options.



The second drive version for which DEPRAG is famous for, is the air-motor. Gerd Zinn describes its advantages as follows: "Our pneumatic screwdrivers are particularly well suited for tightly spaced screws. Their small size and excellent power-to-weight ratio speak in favor of this type of drive". The robust and simple design of the



vane motor is well suited for a heavy-duty, continued use in an industrial production environment. The torque ranges of the MICROMAT/MINIMAT series of pneumatic screwdrivers ranges from 0.008 to 180 Nm [0.07 – 1,593 inch pounds] and offers high driving speed and high repeatability at a low system price for an excellent ROI.

The DEPRAG air-operated screwdrivers deliver a torque repeatability of well below plus / minus three percent standard deviation over millions of cycles, regardless of air pressure fluctuations or screw joint characteristics. That is the advantage of the tried and tested MICROMAT/MINIMAT automatic shut-off clutch. Its function prevents uncontrolled torque variations. The shut-off clutch transfers torque at the pre-set value to the screw, then decreases the torque despite the continued rotation of the drive [inertia] and stops the air motor at 50% of the applied torque thus minimizing the effects of inertia on the screw joint. Speed fluctuations between hard and soft screw joints and fluctuations in air pressure have no influence on the tightening torque. This enables the screwdriver torque to be reliably set without having to consider the individual joint. This high precision is a condition for the industry norm machine capability study and which is available on request for each of these screwdrivers.

The standard model is the MICROMAT/MINIMAT, whose integrated function control-port monitors the screwdrivers on and off condition and signals that the set torque has been achieved when the clutch disengages and the motor stops. The depth of screw insertion can also be monitored by means of length comparison using a proximity sensor array.

DEPRAG assembly tools are also available for various special applications. For instance, with self tapping screws the thread forming torque can be higher than the final seating torque. The tool of choice here is

the specifically developed SENSOMAT® screwdriver spindle. It drives the screw home with full motor power - right up to the point where the screw head begins clamping the materials. At this point the highly accurate shut-off clutch is engaged and over-tightening of the screw is prevented.

Jürgen Hierold, DEPRAG sales manager: "In choosing the right screwdriver you must focus on the individual application". If process parameters have to be identified and documented for the quality management process then an EC-electric screwdriver or an EC-Servo screwdriver is the right tool. Electronically operated, programmable screwdrivers are also suitable where high flexibility is needed, i.e. where screw assembly parameters vary or for frequent product changes on a flexible assembly line. When data collection and flexibility are clearly not needed, then the pneumatic torque control screwdriver with function port is the most economical and technically superior solution.



The requirement for flexibility and process control are not the only parameters that must be considered in the selection of a suitable fastening tool for your application. Consideration must also be given to the necessary torque accuracy, the requirements for data collection and statistical processing, purchasing, operating and maintenance costs, the desired power range, the tools longevity and the availability of the drive media [bits/sockets] for the tool used. The decision for the drive system may depend on a combination of several of these differently influencing factors or it may come down to just

one. For instance, the absence of compressed air immediately excludes the use of a pneumatic screwdriver. In summary one can assume that the selection of the optimum system for a particular application is only possible in consultation with design experts and sometimes by extensive preliminary tests such as a screw joint analysis. Sales Manager Jürgen Hierold: "The DEPRAG specialist will help you to select exactly the right assembly tool and can also advise on the configuration of the complete system."



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DEPRAG SCHULZ GMBH u. CO. also has a laboratory for joint analysis, which examines difficult fastening applications. After the analysis, we will propose solutions for assembly equipment and help establish the correct screw assembly parameters. With over 80 years of experience in the field of screw driving technology and the related measuring technology, DEPRAG is a full service provider with 600 employees in over 50 countries.

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