

## Press Release

Process reliability starts with the selection of a suitable tool

### The correct screwdriver guarantees a high quality product!

Basic information regarding screw assembly technology

In the domain of technology, screw joints are the most frequently used method for joining components and, in many cases, to separate them again. Screws can be tightened and loosened again without damaging the connected components in most applications. In today's environmentally aware times, people have come to understand the value of the materials contained in defunct consumer goods. The edict is "prudent reuse of resources". If we consider recycling demands alone, it can be argued that fastener connections have their undeniable place in the modern assembly process. One can only effectively disassemble an item for targeted reuse if it was fastened together.

The screw assembly process gives the impression of being a very simple task, but in the assembly process it is encumbered with many potential pitfalls. From the moment the screw is seated, the assembled components behave like a single part. It is the task of the screw to clamp the components together with sufficient force so that normal use will not influence the integrity of the assembled joint. Achievement of this force - called pre-tension force - is defined by the designer, but can only be measured with great difficulty and effort during factory assembly. This poses a huge problem for the goal of zero-defects. Since "Pre-Tension" cannot be measured using practical methods during assembly, the value "Torque" is used. The Torque value can be derived from the required pre-tension force and has therefore become the process-control measurement in screw assembly.



Every manufacturer strives to avoid quality issues as a result of faulty screw joints. They can result in product recall campaigns or the return of an entire batch of product from the end user, The economic and market image damage can be significant. Besides training of staff and the use of high quality materials, selection of the correct screwdriver for the application plays a major role to ensure reliability in the assembly process.

DEPRAG screwdriving expert, Rudolf Schmidbauer, relates from experience: "A screw task can only be performed with process reliability, when the work is performed by high precision screwdrivers". In the screw assembly case study laboratory at the Head Office of DEPRAG SCHULZ GMBH & CO. in Amberg/Bavaria, Mr. Schmidbauer assembles and loosens screws on a daily basis, measures the quality of the screw joints and analyzes product design and materials. "It is important that the screwdriver is optimized for the application".

In his laboratory he works with screwdrivers produced by DEPRAG. "Our screwdrivers are not only reliable, they also have an extreme long service life. The drives are very quiet and the ergonomic design is well-thought-out. They are light and fit the hand comfortably. These factors help to protect the worker from fatigue, even when involved in industrial mass production".

The DEPRAG product range is very broad. Besides screwdrivers, designed for automated machinery, the focus is also on manual screwdrivers for industrial mass production. The full service provider DEPRAG has developed a competency in the field of screw assembly technology over decades of firsthand experience. Most screwdrivers can be combined with DEPRAG measurement technology or with the proven DEPRAG screw feeder systems. Sales Manager Jürgen Hierold is confident: "We can offer the suitable screwdriver for every screw assembly application at an attractive cost-performance ratio".

The wide spectrum of demanding screw assembly tasks are addressed by the MINIMAT/MICROMAT manual screwdriver series. With torque a range from 0.02 to 80 Nm, configurations for every application and the most modern motor-drive technology, they achieve maximum process reliability at every step. Depending on the application, the user can choose between a straight design for vertical screw insertions, pistol grip design for horizontal



assembly and angle head design for confined spaces and high torque requirements. In addition to the air-screwdrivers with which DEPRAG made its name, the extensive portfolio includes also a series of renowned electric screwdrivers. But, which screwdriver is best suited for what assembly task?

The stationary MINIMAT-EC servo screwdriver spindle with a reliable and low maintenance brushless EC-motor, offers a high degree of process reliability for industrial production. Maximum flexibility is achieved with this drive technology and the associated AST30 control system, which is suitable for manual or automated assembly process. All essential process parameters are set in the control system. An Integrated torque transducer and an angle encoder measure the torque and angular displacement actually applied by the tool. These values can then be documented and evaluated for purposes of quality control.

The MICROMAT-E for smaller torques from 3 to 80 Ncm, as well as its big brother the MINIMAT-E have a brushless electronic drive and the associated AST10 motor control system combined with angle measurement. The process parameters for the screw assembly task are stored, processed, documented and evaluated by the screwdriver controller.

Both screwdriver series, the EC and EC-servo design, allow interface to a higher level control system, i.e. for statistical data processing.

The digital electronic screwdriver of the series MINIMAT-ED, which was recently developed by DEPRAG, has proven to be a flexible all-rounder. When the adjustable screwdriver torque is reached, it switches off reliably and very precisely via an electro-magnetic clutch. The required torque is conveniently entered by the worker via an on-board controller and user-interface directly on the screwdriver, where the entered value is displayed on an easy-to-read LED. The MINIMAT-ED is especially suited for workplaces having a variety of assembly tasks and torque requirements. Therefore, it is ideally suited for the recycling industry where mass-production, re-work or repair is needed.

The DEPRAG pneumatic screwdriver of the MINIMAT/MICROMAT series – air operated – is a basic solution for any fastening task where documentation is not required. Its specially designed, high precision shut-off clutch allows torque repeatability of less than +/- 3% standard deviation. This level of repeatability can be relied upon for millions of cycles. The DEPRAG shut-off clutch reliably prevents any

"over torque", as is the case with conventional stall type screwdrivers. The design of the shut-off clutch also insures the screwdrivers' repeatability regardless of any air fluctuations. The Screwdriver performance can be verified by means of relevant torque measuring devices.

The manual screwdriver MICROMAT-F/MINIMAT-F is equipped with an additional functional controller for error proofing of a manual workstation. The associated FC 20 control system is designed to oversee and control the screw assembly process. In case of faulty or incomplete assemblies, the FC20 control system blocks the connected F-screwdriver from further operation and blocks the release of faulty parts to reach the next process. The subsequent assembly process can only be started if the previous task was completed properly. The correct number of tightened screws per assembly can also be controlled. The screwdriver therefore checks its own operation (and that of the operator).

The DEPRAG SENSOMAT is designed specifically for self-tapping; thread-cutting or self-drilling screws. Due to the high friction during the thread forming process, the torque required to form the screw thread is close to or higher than the torque required to seat the fastener.

The DEPRAG engineers have adapted the SENSOMAT for this problem. It first tightens the screw at full motor power and engages the shut-off clutch only shortly before the screw-head bottoms out. That way, the required final torque can be accurately achieved without any damage to the screw joint.

There are numerous manual screwdriver series available for special applications. For example, the DEPRAG impulse screwdrivers - straight and pistol grip design - are available with and without an auto shut-off clutch. These are impact screwdrivers, however, with an integrated hydraulic impulse mechanism. The impulse screwdrivers are preferably used for high torque applications, and where high torque repeatability and minimal torque reaction is required. In addition they operate at a very low noise level when compared to a traditional non-hydraulic impact driver.



DEPRAG impact drivers are available with a pistol grip or fist grip. For impact screwdrivers without a gearbox, the hammer is connected directly to the rotor. Energy is "accumulated" with every rotation, which is then transmitted as a powerful impact onto the drive shaft. Impact drivers are suitable for torques between 90 and 2.100 Nm.

The MINIMAT-T Depth shut-off screwdriver is designed specifically for applications where the screw must be stopped at depth only, and where a shut-off at torque is not required. For example, when fastening wood screws or inserting screws to mount drywall to a frame, a consistent torque cannot be relied upon. A sensor sleeve, which is set to a defined screw depth/travel value, captures the screw depth and precisely triggers the shut-off clutch of the screwdriver. That way every screw is seated to the specified depth.

The VARIOMAT on the other hand, was developed specifically for the wood industry. An operator can use it for both drilling and screw assembly in one step. The offered extensive accessory kit allows for many different application possibilities.

The RECYCLING screwdriver is a special tool for the recycling industry. Prior to chemical or thermal treatment of electronic scrap material, the parts must first be disassembled. The DEPRAG RECYCLING screwdriver reinforces the bit-to-screw engagement by ramping up the screwdriver speed. It also applies the necessary end-load pressure onto the screwdriver bit right from the start, which helps prevent a cam-out or the stripping of the screw-drive. The ergonomic grip helps increase the strength for loosening a fastener and the necessary reverse-torque is applied to handle corrosive or deformed parts. The pistol



grip design is for use in horizontal applications, and the inline design [incorporates an adjustable safety clutch - LH operation] is for vertical applications.

If screws have to be assembled with limited vertical access, the flathead screwdriver can be used. It is designed to assemble screws or nuts from M3 to M18 and is furnished with interchangeable tool adapters - square drive or hexagon. An open head is available for nut assemblies that are tightened over pipes. When the air supply to the flathead screwdriver spindle is turned off, the worker can also use the wrench to manually tighten a fastener in the same fashion as he would with a manual tool.

Ergonomic design of the tools has always been a "must" of the DEPRAG product development... "We have therefore designed the grips according to latest medical insights" is how Sales Manager Jürgen Hierold explains the advantages of the MICROMAT/MINIMAT screwdriver family. The high power density of the motors allows a very slender construction and a convenient light tool weight. "The MICROMAT screwdriver with the lowest torque range is approximately the size of a ballpoint pen. With its slender form it is designed with special recessed grips, helping to prevent strenuous holding positions".

Strenuous posture or forearm fatigue as a result of gripping, are addressed in the MINIMAT screwdrivers by a well thought-out design. DEPRAG Development Manager for serial devices, Gerd Zinn, explains: "The design of the hand grip as a modified square grip complies with the natural anatomy of the hand and allows friction-and form-fit force transmission. Lower worker fatigue promises higher quality in industrial applications of the screwdriver".

"DEPRAG SCHULZ GMBH & CO." with its headquarters in Amberg/Bayern has 600 employees in more than 50 countries. The expert for screwdriving technology always sets new directions in the market for screwdrivers through innovation and product improvement. But customer consultation is close to the heart of the company. Jürgen Hierold: "Together we will find the right screwdriver for your application. This is one way we can help our custom to achieve a Zero-reject production ".

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