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Press Release

Assembly concept for top processing reliability

Mastering safety concerns in the screwdriving process

Processing reliability while screwdriving

2014 was a record year for vehicle recalls. The Center of Automotive Management (CAM) in Bergisch Gladbach published a study on 14.01.2015 which discovered that in the past year more vehicles than ever before had been recalled due to safety defects such as leaking brake lines, brake failure and defect airbags. One source for this was the US market where almost 63 million vehicles were recalled to garages due to safety issues – more than twice as many as the previous highest number in 2004.

The DEPRAG equipment assortment for safety critical assemblies

The factors responsible for this trend are structural causes, such as the increasing technological complexity of vehicles, the increased pressure to keep costs low and the use of modular and common part systems in production. In order to remain competitive in the fierce market the producers must guarantee the highest quality and safety at every single stage of production. DEPRAG supports their customers in this by fulfilling legal requirements for screwdriving systems and tools in the automobile industry and therefore protecting the customer from product recalls which may otherwise occur due to faulty screw connections.

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During assembly the most demanding of requirements are those of processing reliability. There are a whole range of factors to consider: The correct screwdriving tool with the optimal tightening procedure must be determined, the order in which screw assembly is implemented and individual processing steps are documented and integrated into the manufacturing execution system (MES). One approach to fulfilling high quality standards of vehicle production relies upon the selection of suitable screwdriving technology. Intelligent screwdriving systems based on EC technology enable the recording, evaluation and documentation of individual assembly steps. For components critical to the safety of the product, which are common in the automobile industry, the recording and analysis of torque results via an independent sensor system is of enormous benefit. The DEPRAG EC servo screwdriving technology in combination with the use of additional torque systems is the ideal solution for this kind of specification.

Additionally the DEPRAG EC and EC servo technology screwdrivers are extremely precise. Depending on requirements and the programming of tightening sequences they enable torque accuracy of less than ±1% standard deviation or relating to the machine capability study, a Cmk value of ≥1.67 at ±5% tolerance relating to 6 Sigma in accordance with ISO 5393 and thereby the same low error rate of 0.6 per million screw assemblies and all that with a halved tolerance window. EC or EC servo technology also can be offered as a solution when screwdriving systems which can communicate with higher level processing data storage are required, such as operating data acquisition and statistical processing control.

The DEPRAG EC/EC servo screwdrivers fulfill high quality standards

The DEPRAG Minimat®-ED with electro-magnetic shut-off clutch

The electronic handheld screwdrivers from the DEPRAG range can cope with the highest demands of industrial assembly and excel through their special ergonomic design. The MINIMAT-EC servo screwdriver and the flexible MICROMAT-EC/MINIMAT-EC screwdriver with brushless EC motor in combination with the AST40 controller offer maximum flexibility and processing reliability even in manual work stations. The integrated torque and angle measurement system enables the exact control and regulation of screw tightening as well as documentation of important processing parameters, thereby guaranteeing precision. Several different tightening parameters can therefore be achieved during one assembly cycle. The cordless screwdriver MINIMAT-EC is the intelligent choice for top quality, reliable screw connections – all without the interference of a cable or hose. It is a perfect combination of tried and tested precision engineering and the best possible shut-off accuracy.

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The digital electric screwdriver MINIMAT-ED with electromagnetic shut-off clutch features torque setting options on the screwdriver itself: just connect up and set off! The innovative screwdriving tool is therefore particularly suited to work stations with varying tightening parameters. It is just as suited to controller and controller cabinet construction as in an industrial reconditioning station in high volume production assembly or in repair stations. If there is no compressed air available the economic electric screwdriver with mechanical shut-off clutch is an excellent alternative.

The DEPRAG Minimat®-ED with electro-magnetic shut-off clutch

Almost all screwdrivers of the MICROMAT/MINIMAT series can be combined with the DEPRAG screw feeding devices. The screw feeding systems themselves are made up of a nosepiece - adapted to the customer's specific screw and application which is designed to receive the screw, a mouthpiece guide and a hose set. Screw feeding machines are available in the standard program either as a vibratory spiral bowl or sword feeder.

The DEPRAG Minimat®-EC with AST11-1 controller

It is obvious why error free screw connections are so vital for vehicle production – they could mean the difference between life and death! So-called safety critical screw joints contain risks for life and limb and the environment. These screw joints can for example be found on the seat belt mechanism or the steering column of a vehicle. All screws which are important for the correct and proper function of a component are considered functionally critical. A possible consequence of such an impairment to the function would be for example when a car unexpectedly breaks down.

The manufacturer must therefore explicitly investigate every application case and determine the correct method for the assembly of each type of screw joint. If a manufacturer wants to guarantee the safest and most error free function of their product then the decision to invest in reliable technologies is the only way to go.

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Work place components are specifically designed to provide high processing reliability during the first steps of assembly processing. As well as tried and tested high quality screwdriving tools, the work stations consist of screw and part feeders, screw positioning systems for reliable operator guidance, screwdriver and sequence controllers with the relevant software, part fixtures and positioning equipment all perfectly coordinated to work together.

The intelligent manual work station

The specialists at DEPRAG SCHULZ GMBH u. CO. have spent decades researching the complex requirements for reliable screw assembly and they provide a comprehensive line of sophisticated standard modules which can be used to create reliable, economic and ergonomic manual work stations. The structure of the manual work station is thought out in detail and designed with the required processing reliability.

"Intelligent" Workstation

As well as the correct screwdriving tool, screw feeding is an essential basic component of the manual work station. DEPRAG feeding systems increase the level of automation and improve the ergonomics of the manual work station. If the geometry of the connection element allows then feeding is carried out through a calibrated feed hose. If feeding with a hose is not possible then the Pick & Place System provides the required automation.

DEPRAG relies on the success of their user friendly equipment in the manual work station which enables optimal production, fatigue-free and reliable work. Perfectly coordinated stand and portal solutions guide the screwdriving tool securely to the assembly position and take the strain off the operator. Position control systems ensure that at the right place, at the right time, the correct connection element is assembled to the correct torque. The DEPRAG Feed Module enables screw assembly via vacuum for difficult-to-reach screw positions (e.g. rounded housings). Screws and nuts are held in place by vacuum technology. The operator can therefore also reach critical screw positions. Using cylinders the integrated stroke mechanism guides the precise pressure needed for the connection element independently from the operator.

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Another noteworthy element is the technical cleanliness. Dirt particles can damage the product or the system to which the product belongs, therefore it is essential to avoid abrasion, reduce abrasion or target and remove abrasion! These are the vital requirements for screw assembly in a cleanroom to ensure the quality of components to be assembled. The DEPRAG Clean-Feed concept provides a complete solution. During assembly of highly sensitive parts the electronic components are protected from that by the targeted dispersal of electric charge. This is a universal feature of ESD capable DEPRAG solutions; it is recordable and traceable for the end customer. The demands for technical cleanliness and ESD capability must be realized throughout all individual components of the system. This is another advantage of all components coming from the same source.

Particle Killer & vacuum tooling used for technical cleanliness

Another important component when attempting to achieving high processing functional reliability is the controller system DCOS (DEPRAG CONTROLLER SYSTEM). Intelligent software packages combined with standardized hardware based on an industrial PC enable individual solutions which can be tailored to any application. Perfectly designed interfaces between standard components and an intuitive operator guidance guarantee highest operator comfort. The range of software packages available are known as DFUN, DPRO, DVIP, DAST and DSPEC. DEPRAG FUNction combines and controls all standard functions of the manual work station. DEPRAG PROcess enables processing control and recorded data to be further processed according to the customer's needs (BDE, MDE, MES, Industrie 4.0). DEPRAG VIsion and Position enables position control guidance and visualization of the assembly tasks. Using the DEPRAG AblaufSTeuerung sequence controller software all EC screwdriver controllers can be controlled centrally from a DCOS operating panel, and additional custom made software is provided by DEPRAG custom SPECification.

The manual work station has a base frame made of aluminum onto which all essential components are built. Depending on requirements this can be build up as an individual work station or as a complete assembly line. Base frames are available in various standard sizes and the height can be adjusted electronically. The rotatable part fixtures enable access from all angles. The frame features an integrated part fixture e.g. a gripper with "Pick-to-Light" display and has an incorporated light and energy supply.

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The DCAM for automated screwdriving and assembly tasks

For applications where several processing steps must be reached quickly and precisely the DCAM is a great compact and space saving solution. The DEPRAG COMPACT-ASSEMBLY-MODULE in typical DEPRAG design impresses through its high functionality and renowned reliability. The advantage to the customer is the established technology in well-arranged standard modules. The modular platform concept allows for the most varied of assembly and processing tasks. The DCAM is a compact work platform which combines efficiency with the best possible reliability. Standardized work areas of up to a max. 600x600 mm with two to three freely programmable axes are available as standard. There is an option of either the step motor or servo motor as standard. The operation of the module is carried out via touch panel on the DEPRAG control and operating unit DPU. Processing programs can be generated by an editor and can also be entered offline via a PC.

"DCAM" – DEPRAG Compact Assembly Module

There are many advantages to a DCAM, the automatic part guidance, a continuous working process, short cycle times and like working sequences are achieved by rationalization. Controlled automation and comprehensive documentation options during the assembly process provide total quality assurance. The freely programmable axes in X-Y- and Z-directions provide flexibility. The modular and clear structure gives the benefit of quick and easy adaption to a different application.

The DCAM has proved itself as an ideal working platform for screw assembly. It is equipped with DEPRAG screw function modules and screwdrivers of the series MINIMAT, MINIMAT-EC and MINIMAT-EC servo as well as a suitable screw feeder so that every task can be achieved with top reliability. The advantage for the user: as a one stop shop DEPRAG provides a complete system solution, all components are coordinated to work together and inclusive of their comprehensive service package.

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DEPRAG SCHULZ GMBH u. CO. employs 600 workers in over 50 countries with headquarters in Amberg, Germany. Their expertise in high quality EC servo screwdrivers and EC screwdrivers, sophisticated measurement technology and first class feeding machines make them a sought-after contact in the field of reliable screwdriving assembly.

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