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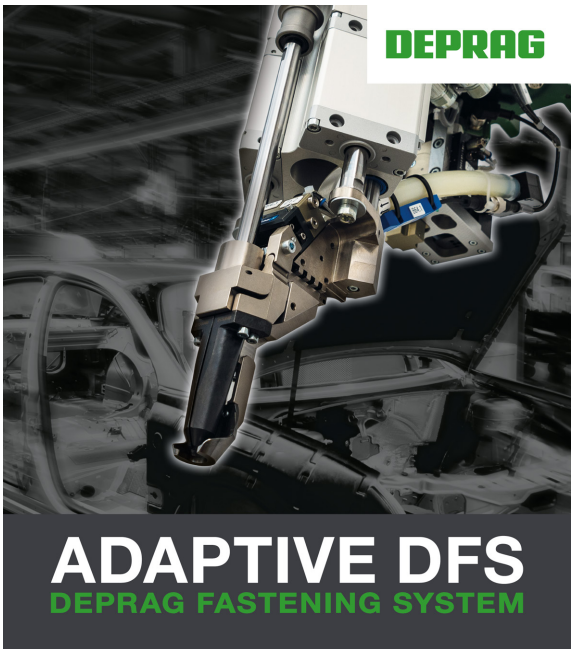
Press Release

The intelligent screwdriving system for lightweight construction joints

ADAPTIVE DFS – the adaptive DEPRAG Fastening System: automated and controlled flow-form-screwdriving

Optimal processing due to automatic adaptation to varying parameters

CO^2 reduction and increased load capacity in E-mobility: both are aims that are becoming achievable due to lightweight vehicles. This has long been recognized modern automobile engineering-- resulting in shift to lightweight materials instead of conventional steel for chassis design.



From high safety requirements, reliability of materials, simple repairs, easy replacement of bodywork components to recycling and the possibility of reuse - all are considerations which present challenges to the automotive industry. These necessitate a complete rethinking, even in assembly. The choice of the correct joining technology is critically important in lightweight construction. Flow drill screwdriving has established a place for itself within chassis design.

The specially formed tip of the so-called flow drill or flow form screw generates frictional heat under high pressure and at high speeds, effecting a flow process in sheet metal which has not been pre-drilled. At the start of the process a "crater" is formed in which multiple threads are cut after the screw has penetrated and formed a funnel passage at reduced pressure. A machined thread is created that can accommodate a "normal" screw if repairs are ever carried out. Once the flow hole has been shaped the speed is decreased, the next step is the pre-tightening of the screw until head contact is made and then final tightening of the fastener to the pre-set parameters of torque and angle.

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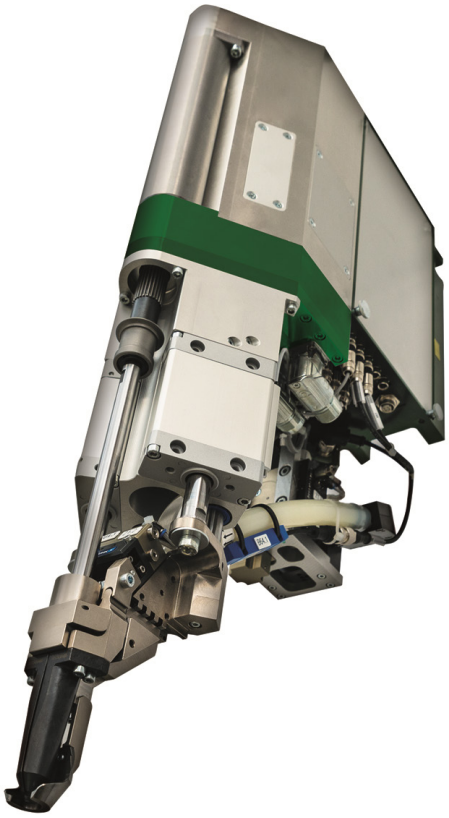
The complete procedure usually takes less than two seconds. Additional fastener components such as nuts are not required, because the assembly optimally penetrates and forms the thread for the screw so that the screw sits securely. There is no need for initial drilling or punching holes in the component.

This process not only enables the connection of sheets of varying materials but it also offers clear advantages in relation to processing costs and time. But is this screwdriving process also suitable in applications with fluctuating tolerances and varying components?

In order to ensure high screwdriving quality despite component tolerances, such as deviating positions, sheet material thickness and screw length tolerances or structural differences, current solutions on the market are only able to offer screw assembly systems where settings for screwdriving parameters are time-consuming and have to be separately determined for each screw position. Usually the feed-movement and feed-force is provided by a compressed air cylinder with proportional valve. The precision needed to alter the status of feed forces and positions can potentially leave a lot to be desired. The behavior of the compressed air can prevent individual processing steps from being followed with any accuracy. The transition from funnel forming (phase 3) to thread forming (phase 4) is particularly critical. There is a danger that if the screwdriver speed and/or pressure is reduced too early the funnel is not fully formed and the heightened drilling torque could destroy the screw or the component. Any delay in the transition could damage the newly formed threads -- compromising the connection joint.



ADAPTIVE DFS

No need for costly analysis of screwdriving parameters

The screwdriving technology experts at DEPRAG have now eliminated these risks. We now offer an adaptive flow form assembly unit with regulated electric drive, both for the feeding and the screwdriving process. This enables a highly dynamic interaction with the processing factors of pressure and screwdriver speed, independent from the constantly determined current status.

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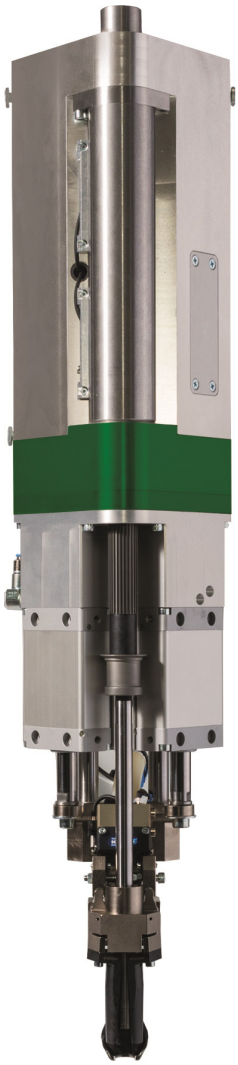
Unlike traditional systems, the new adaptive assembly unit Adaptive DFS can prescribe and monitor the feed speed and feeding procedure. The constant data reported by the control modules enables the precise and automatic recognition of all relevant penetration points. Time-critical and essential parameter changes are autonomously performed by the fastening system.

This system ensures the ideal processing parameters, independent from the tolerances of the product or fastener. It significantly reduces the effort of preliminary analysis and characterization. Costly and extensive repair procedures - caused by imprecisely formed holes, jammed screws or ruined threads - are minimized.



The optimized processing-parameters that have been automatically adapted to suit each situation, guarantee that the parts to be connected (fastener and product) are subjected to the least amount of strain. The additionally captured processing-data allows increased process documentation.

Separate electronic regulation for the EC-Servo screwdriver and the EC-Servo stroke technology, in combination with the extensive parameterization possibilities, ensure the highest flexibility during the processing of multiple materials and material combinations. The implementation of special tightening sequences for new fasteners and materials is possible. Especially for the assembly of newer materials such as carbon-fiber (CFRP), the controlled feed stroke allows exact positioning and trigger-points to be clearly defined. This is a benefit which should not be underestimated for new materials whose behavioral patterns (e.g. delamination during perforation) are not yet predictable.

The new assembly system works at a speed of up to 8000 rpm at a maximum torque of 15 Nm (133 inch-pounds). The regulated electric feed drive enables any number of precise positioning maneuvers and allows secure retention of the screw using a socket, which is particularly important for under-floor screw assemblies. In addition, the cycle time is reduced per screw assembly as only a short feed stroke is needed. During thread forming and screw tightening, the limits determined by material (such as speed, torque) can be optimally utilized.

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Whilst the system moves to the next screw position, the next screw is already being presented and the main part of the feed movement is carried out. The screwdriving system is optimized for the shortest cycle time.

A new and important feature of the adaptive assembly unit is the central introduction of pressure in the screw axis. Pressures of up to 3000 N no longer cause cantilever loading; this is particularly positive in relation to the wear on bearings and guides. Compact and weight-optimized construction is guaranteed. The low weight means that the unit is particularly suited for use with robots. The slim design, with a width under 170 mm (6.7-inches) and minimal projecting edges enables accessibility to even the most difficult-to-reach screw positions. The screwdriving system can be easily adapted to suit the most varied of connection elements by the simple exchange of screw specific components. The modular design in combination with quick change chucks makes the system particularly maintenance-friendly. The system can also be optionally fitted with an automatic tool exchange system.

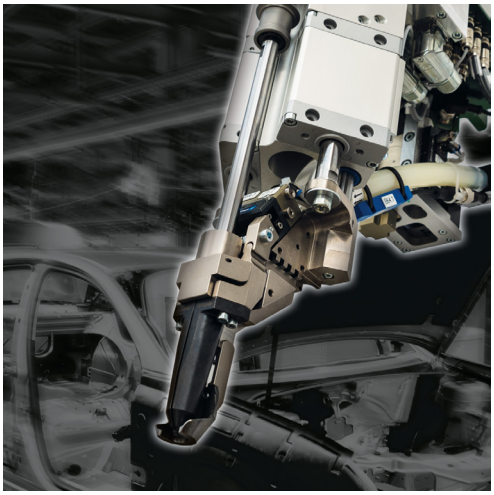
Screw feeding can be provided by two different methods: screw feeding via feedhose or presentation by a magazine loader.

In order to satisfy high demands for maintenance and service-friendliness and to minimize downtime, the assembly unit is constructed modularly. Components, which are continually in contact with the workpiece or fastener and thereby more susceptible to wear, can be replaced at the touch of a button--without tools or special expertise.

The assembly system has an ergonomic, intuitive operating interface. Comprehensive integrated diagnostic functions comprise the basis for preventative maintenance and maximum efficiency of the system. Complete documentation and evaluation is possible through the recording and readout of processing parameters and screwdriving results.

An additional advantage is that mechanical and electric interfaces are primed for quick installation of a camera or laser pointer for documentation of the screw position geometry, monitoring accessibility of the screw positions or convenient "teaching" of the screwdriving positions.

If you cannot visit us at a show or in person, Please use the following link to read more about this product: Adaptive DFS Catalog Link



ADAPTIVE DEPRAG FASTENING SYSTEM

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