

Press Release

Technical cleanliness for your assembly process

CleanFeed - the right concept to eliminate harmful particles

Integrated design for the reduction of contaminating particles

Technical cleanliness is gaining increasing importance, particularly in the automotive technology. Minute particles can cause devastating damage. For example when components are assembled onto a PCB a tiny stray piece of metal could connect two of the conducting strips and cause a short. Contaminating particles themselves have an effect on how components function. They can clog up jets and filters, block valves, or cause bearings to jam. The requirement for ever higher power density means that components and units are increasingly more complex, with much tighter tolerances. In recent years the importance of technical cleanliness has grown tremendously. It started with active and passive driving safety systems such as ABS, progressed to include diesel and direct injection models, to now also include variable camshaft phasing and lead-free bearing cups.

With the aim of preventing hazardous contamination caused by particles just 50 - 1000 µm in size, the VDA has created some comprehensive guidelines in its VDA 19 publication for the inspection of technical cleanliness and "VDA 19.2 Technical Cleanliness in Assembly" for processing clean components.

Looking at the assembly process as a whole

"Technical cleanliness is not an isolated process. The technical cleanliness concept affects every department. It starts with staff training, and continues through the engineering design, the manufacture of the components, the manufacturing environment, logistics, assembly, the assembly equipment and the assembly environment," explained Jürgen Hierold, DEPRAG Sales Manager. And now the choice of appropriate assembly equipment to cope with joining technology is coming increasingly under the microscope. "This places a heavy demand on us as manufacturers, which can be achieved only by providing components that are harmonized to one another, along with innovative technologies, without major additional effort and at a competitive cost," added Jürgen Hierold.

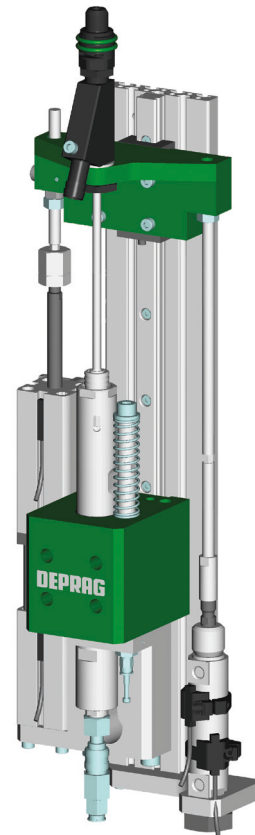
"In our CleanFeed system we have developed a comprehensive concept for technical cleanliness, which includes decades of knowledge in regards to which process to use, what solution to offer and which components to develop especially for technical cleanliness," he continued.

As early as the 1980s DEPRAG SCHULZ GMBH & CO, the screwdriving system specialist based in Amberg, was already tackling this problem. And with success! The machine builders were supplying renowned US manufacturers with screwdriving systems for CD assembly units. "Assembly conditions for the screwdriving process corresponded to sterile room requirements" recalled Hierold. "Our customers were pleased with our method of including all the planning, production and assembly steps into our solution." The fact that all the components could be harmonized with one another because they all came from a single source, proved to be an advantage. The one-stop-shop company convinced its customers with the high-quality, well balanced sections, all of which had the goal of - preventing any abrasion as the fasteners were fed into the screwdriving system and systematically extracting contaminating particles during the actual fastening process.

So what is the best procedure to adopt? First, obtain an accurate definition of the cleanliness requirements for the product in question. Only in cooperation with the quality management department, the design engineers, the production and logistics is it possible to achieve the highest possible level of technical cleanliness and thus reliability. Trained staff is just as important as a clean production environment. The crucial point is that the clean room should be maintained in a state of meticulous cleanliness. The principal aim is to prevent disruptive particles from being brought in by humans, materials or transport systems.

As early as the design stage of a component it is possible to avoid geometries where particles could collect (for example, by creating a through-bore rather than a blind bore). Moreover, it is a good idea to choose suitable materials, such as polished stainless steel or anodized aluminum surfaces. Along with the screwdriving tools deployed in sterile rooms, the accompanying feeder technology is gaining in significance too.

By choosing the right technology the number of particles can be greatly reduced as the fasteners are separated from one another. Standard vibratory feeders move the screws by creating a wave motion inside the conveyor hopper. The screws rub



*Use gravity to your advantage – Inverted
Screwdriving with the DEPRAG-Inverted Screw
assembly unit*

against each other and harmful particles are created by this rubbing action.

Sword feeders are the alternative to vibratory bowl feeders

Sword feeders are the alternative to vibratory bowl feeders when a non-abrasive feeder is required in order to protect the components. DEPRAG sword feeders are available in two sizes: with a filling volume of 0.15 liters or 1.5 liters. A sweeping motion scoops the screws from inside the storage container into an appropriately adapted segment-shaped lifting rail (sword). On this rail the screws slide through mechanical chicanes by gravitational force, and are therefore sorted when they arrive at the screw separator. Any parts conveyed at an incorrect angle pass through mechanical chicanes back into the storage container.

A sensor on the rail governs the number of lifting strokes required. If the operator is processing fewer screws, the feeder correspondingly supplies fewer of them. Where several different operators work with a single feeder unit,

working efficiency can often suffer due to the differing working paces of each of the workers. The sensor makes sure that each operator works at his or her utmost efficiency. When the screwdriver is operated by one operator, the DEPRAG feeder unit adjusts to that person's individual working pace. When the shift changes the next worker can call up his own operating parameters (up to ten datasets can be stored). None of the workers feels held back and no-one feels pressurized. With the optional RFID interface system, a user chip enables the individually customized settings to be activated - once they have been entered via the display unit.

The level of vertical manufacturing, the use of hardened, wear-resistant materials, and the specific coating procedures ensure consistent high quality, high levels of reliability and efficiency of the DEPRAG sword feeder.

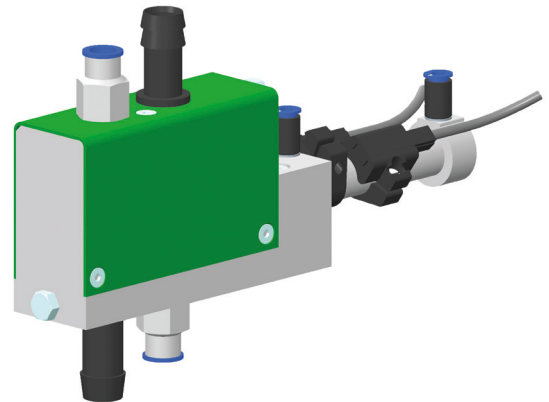


Feeding technology without Vibration – DEPRAG-Sword feeder

Integrated vacuum source increases technical cleanliness

If the screw is fed to directly above the component, contamination by particles is not necessarily prevented. "It is better to look for alternatives", stressed the experts at DEPRAG. "Our Particle Killer provides a tried and tested solution". The feeder system works cleanly and reliably by using a blast of air to shoot the required screw into position for the next screw assembly. Any particles of contamination that may be created during the process are removed by vacuum suction. The extracted particles are caught in a filter with a replaceable filter element. The filter has a transparent inspection window. Next, the cleaned fastener is fed into the screwdriving module (inline version) or made ready for picking (pick and place version). "Vacuum sources at every relevant position

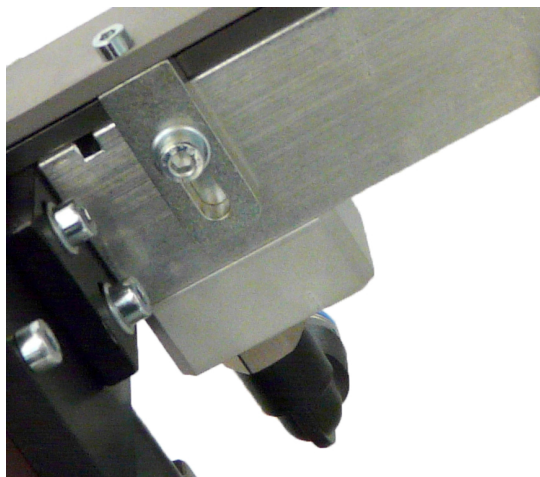
increase cleanliness and are recommended at every point where abrasion can occur", stated DEPRAG Sales Manager Hierold.



Friction removal – the DEPRAG Particle Killer

Beyond feeding technology - the entire process is crucial

There are even more plans for the comprehensive CleanFeed concept. Some undesirable particles caused by abrasion can occur as the screwdriver's bit engages into the drive of the screw. The DEPRAG MINIMAT®EC-Servo range of screwdrivers reduce their speed as they engage with the screw. The integral sensor system assists with recognizing the precise position of the screwdriver and ensures that the bit engages properly into the screw drive. Only once the bit is correctly engaged into the drive does the speed increase ready to carry out the fastening action. This reduces the amount of harmful abrasion. A vacuum source extracts any remaining particles.



Vacuum Particulates – Vacuum fittings and dirt particle filters for all relevant devices

Cover plates and screw templates on the components reduce the risk of hazardous particles falling onto the component. Why not utilize the gravitational force of the

particles? "Because of their compact structure all our screwdriving modules can be used for inverted assemblies", said Jürgen Hierold. Extra equipment such as dirt traps collect any falling particles which can then simply be removed.

The use of ESD-capable materials further reduces contamination caused by electro-static build-up. Jürgen Hierold: "Our CleanFeed total package includes every possible measure to minimize particles."

So when a factory needs to create clean room production facilities they should choose a machine builder who offers every key aspect of screwdriving systems from their own range of manufactured tools. "It's the best way of ensuring that each component and each process, such as feeding, positioning, and screwdriving is harmonized to each others. The entire process can be examined, evaluated and enhanced with technical cleanliness in mind."

Miniaturization in technology is coming on rapidly. Technical cleanliness in the production process is a burning topic and has become a quality characteristic. That, which is standard in the more sensitive sectors of the automotive and computer industry, is now a matter of concern for other suppliers and branches of industry as well. Those who comply with these high cleanliness requirements have excellent opportunities in the market. Jürgen Hierold: "With the DEPRAG CleanFeed concept we are ready for the future. We are the professionals."

DEPRAG SCHULZ GMBH u. CO. has approx 600 employees and has representatives worldwide. This One-Stop-Shop manufacturer is a high-grade specialist in screwdriving technology and automation. DEPRAG has a great deal of experience in technical cleanliness through its involvement in the automotive and electronics industries.

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