**Production in a low-particle environment**

**Small cleanroom solutions that are big on efficiency and cost-effectiveness**

**Numerous research, development and production processes call for a low-particle environment. Additional areas with a much lower particle concentration are sometimes needed within these cleanrooms to protect particularly sensitive products. How can these production environments be created as simply and cost-efficiently as possible? Modular building kit systems are ideal for adapting cleanroom solutions to the relevant requirements.**

When using sensitive products in research and industry applications, it is essential to protect them from harmful environmental influences. Air is therefore passed through special filters in what are referred to as cleanrooms, where staff must wear appropriate protective clothing and adhere to special codes of practice. For example, it is vital to avoid abrupt and uncontrolled movements so as not to unnecessarily stir up any particles that are present. “It’s important to raise awareness of cleanroom standards,” says Kevin Haas, a product manager for clean production. “That’s a particular challenge on top of the technical aspects when implementing projects in a cleanroom environment,” he adds. Staff require a certain degree of awareness. They must understand that the way they behave makes a significant contribution to how clean the room is. Besides wearing their protective clothing correctly, including gloves and a mask, it is also extremely important that they observe the correct procedure when entering and leaving the cleanroom through airlocks. These are closed areas between rooms in different air purity classes where staff put on their protective clothing in accordance with predefined rules. Air is prevented from flowing through these airlocks between the rooms when people or materials are entering them. The top priority is to avoid all particle emissions.

**Solutions for cleanrooms in stringent ISO classes**

Cleanroom technology plays an important role in numerous sectors. Requirements differ depending on the product and process. There is no such thing as a standard solution. “Sensitive production environments sometimes include areas that must comply with even more stringent levels of cleanliness. Separate, smaller cleanroom systems are then often a more cost-effective alternative to large cleanrooms. In effect, that creates a cleanroom within the cleanroom,” explains Haas. Sub-processes in camera production take place in such cleanrooms, for example. Lenses are cleaned and assemblies tested under cleanroom conditions, too. These areas must comply with more stringent ISO classes. Wafers for electronic components are also produced in cleanrooms with high air purity requirements. Whereas ISO class 7 or 8 is adequate for most applications, ISO class 5 is often required in these special production/assembly areas. This means up to 100,000 particles with a size of 0.1 microns or larger are allowed and just 823 particles with a size of 1 micron or larger.

**Mini-environments instead of large cleanrooms**

When consecutive work steps need to be carried out under different cleanroom conditions, companies have previously often adhered to the strictest requirements, meaning the entire production process takes place in a cleanroom complying with a more stringent ISO class. However, that creates more work and associated costs. Modular solutions such as those offered by item are more cost-efficient. Users benefit from much lower procurement costs, as they only need to equip smaller production areas with appropriate cleanroom technology, rather than an entire room. Process enclosures can be designed with complete flexibility in the shape and size required and with the appropriate equipment. Cleanrooms up to ISO class 2 can be designed based on state-of-the-art filter technology and using components that are geared to the specific requirements. From an individual workstation with a laminar flow box to a partial enclosure or a machine cabin, numerous [cleanroom applications](https://de.item24.com/en/theme-world/machine-enclosure-system-xms/clean-production/) are possible using modular item components. “For the quality control of lenses in camera production, for instance, it’s relatively easy to convert work benches within a cleanroom to create a cleanroom workstation complying with a more stringent ISO class. By contrast, larger enclosures with walk-in access are needed for consecutive process steps that are all to take place under cleanroom conditions,” continues Haas. The appropriate solution depends on numerous factors and is influenced by the process itself, the air purity class required and the space available.

**Customised design thanks to numerous modular components**

One way of creating smaller cleanrooms within a cleanroom is to install a laminar flow box with a height-adjustable work bench from item. The filter fan unit draws in air, filters it and creates a clean, low-turbulence airflow inside the box. The filtered air displaces the air in the box and prevents contaminants in the work area. The displaced air is routed away via a perforated sheet without swirling around. “With these mini-environments, we meet the requirements of ISO class 5. The interior of the box can be equipped with pivot arms to supply materials and tools, and with other components from the item Work Bench System. It can be flexibly adapted to the relevant requirements,” explains Haas. The laminar flow box can also serve as a variable table upright. The filter fan unit’s hood is suitable for all work bench dimensions and is only used as and when required. If larger production areas need to be protected against contamination, partial enclosures with several filter fan units are available. In this case, too, filtered air flows into the working/production area via the filter in the ceiling. Creating an overpressure prevents dirt and other particles from getting into the room. The interior can be customised with numerous cleanroom-compatible [components from the item Building Kit System](https://www.item24.com/en-de/cleanroom-production), as these parts are specially design for this application. For example, a separate fixing system for creating flush surfaces ensures the cleanroom-compatible construction of walls and ceilings. The smooth, unbroken surfaces of the aluminium profiles that are used for the individual constructions also optimise cleaning and prevent particle deposits from forming. All cables are routed in integrated cable conduits. “In cleanrooms, the outgassing of materials must be prevented as completely as possible. Plastic seals are deemed problematic in this connection. As certified by the Fraunhofer Institute, we therefore only use materials with low outgassing,” emphasises Haas. After all, in addition to staff adapting their behaviour and wearing suitable protective clothing, compliant technical equipment is also necessary to prevent the contamination of components and processes by tiny particles invisible to the human eye. With its cleanroom solutions, item meets all ISO 14644-1 requirements and also provides ergonomic options that offer staff the best possible support with their work processes. ESD-safe work benches for cleanrooms can also be configured. What’s more, customers benefit from an aesthetically pleasing, high-quality and functional design. item offers advice from the start of the project, takes care of project planning – in collaboration with item pluspartners, if necessary – and supplies all components for the custom design of cleanrooms, both quickly and reliably.

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**Caption 1:** The design of cleanrooms varies depending on the product, the process, air purity class requirements and the space available. From an individual workstation with a laminar flow box to a partial enclosure or a machine cabin, numerous cleanroom applications are possible using modular item components.

**Caption 2:** Cleanrooms up to ISO class 2 can be designed based on state-of-the-art filter technology and using components that are geared to the specific requirements. For example, the special fixing system from item creates a variety of wall and ceiling structures with easy-to-clean joins.

**Caption 3:** One way of creating smaller cleanrooms within a cleanroom is to install a laminar flow box with a height-adjustable work bench.

**Caption 4:** A filter fan unit draws in air, filters it and creates a clean, low-turbulence airflow inside the laminar flow box and machine enclosure.

**Caption 5:** If larger production areas need to be protected against contamination, partial enclosures with several filter fan units are available. The interior can be customised with numerous cleanroom-compatible components from the item Building Kit System.

**About item**

item Industrietechnik GmbH is the pioneer in building kit systems for industrial applications and a partner of the manufacturing industry across the entire globe. Today, the item product portfolio comprises more than 4000 high-quality components designed for use in machine bases, work benches, automation solutions and lean production applications. The company has received a string of awards for products with ground-breaking industrial design and end-to-end ergonomics.

item is spearheading digital engineering by driving forward the digitalisation of processes with software tools developed in-house. The item Academy offers training at various levels, with on-demand training and online courses available in multiple languages.

Headquartered in Solingen, Germany, item has subsidiaries in various countries. Some 900 employees worldwide harness their know-how and passion to develop innovative solutions and services. Eleven sites make sure the company is always close to customers in Germany, with a global logistics chain ensuring swift delivery times for all components.

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