TROX® TECHNIK
The art of handling air

AIR DISTRIBUTION STRATEGIES FOR CLEAN ROOMS

Low-turbulence laminar flow.
A low-turbulence laminar flow is characterised by a homogeneous velocity profile and almost parallel flow lines across the entire cross section of the clean area. Contaminated air and hence airborne particles are consequently displaced or 'swamped out' of the clean area. With a low-turbulence laminar flow, airborne particles remain in the zone for only a short time, and if larger quantities of particles are suddenly set free, the air 'recovers' within a short period. The supply air is usually discharged through particulate filter elements (HEPA, ULPA) as final filters.

The highest air cleanliness classes can be achieved with a low-turbulence laminar flow, even in large clean room areas. The average airflow velocities are usually between 0.2 and 0.5 m/s. In other words: The air in the clean room zone is exchanged more than one hundred times per hour. This consumes a high amount of energy.

Turbulent flow.
Turbulent flow means that the primary air mixes with the induced room air. Clean air is not supplied across the entire room but only at selected points, typically through ceiling swirl diffusers. High induction levels ensure a good mixing of the supply air and the room air across the clean room.

Mixed flow.
Mixed flow means a combination of low-turbulent flow and turbulent flow.

It is used to reduce the number of ultra clean zones for which originally a more costly low-turbulent laminar flow system had been installed. Mixed flow ventilation allows for different zones within a clean room: for occupied areas and unoccupied areas. Zones with the highest air cleanliness, i.e. with the highest requirements of safety, are called 'white zones'. Depending on the structure of the clean room system and on the process requirements, a white zone can refer to just one part of a clean room or to a complete clean room area including all installations.

Displacement flow.
The low-turbulence airflow is supplied to the room near the floor. This creates a pool of cooler supply air and the actual source of the ventilation. The convection from people and other heat sources causes the air in this supply air pool to rise. In other words, people breathe fresh air. Contaminants in the air rise together with the fresh air (convection) and away from the occupied zone.