

Fluorescent test particles for the determination of protection factor of safety work benches

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For the handling of dangerous materials in micro-biological and biotechnological laboratories as well as in medical institutions, safety work benches according to EN 12469 and cytostatics work benches according to DIN 12980 are used for the personal, product and diversion protection. In order to guarantee these security functions officially prescribed tests are described in the mentioned standards.

From point of view of the personal protection the examination of the protection factor on the working aperture of the safety work bench is of particular importance. Objective of the test is the evaluation of the number of test particles which enter the work bench' location under overcoming of the air flow on the working aperture.

In addition to the test particles released during the examination, there are also other, naturally existing particles like e. g. dust, abrasion from clothes and devices, danders, etc., within the safety work bench' location. The number of the naturally existing particles in the ambient air normally exceeds the number of the test particles released. A non-selective proof of the test particles by, e. g. optical particle counters supplies, in this case, a number concentration from the sum of the naturally existing particles and the test particles in the ambient air. Thus, the evaluation of the measuring result for the calculation of the protection factor of the work bench is not possible. For this reason, time-consuming micro-biological and chemical procedures with principal disadvantages are currently used for the test described to get the selective proof of the test particles.

New verification procedures for the determination of the protection factor on the working aperture of the safety work benches should comply with particular requirements (EN 12469). The number of released test particles N should not be smaller than 3×10^8 and the suction rate s not smaller than 20 l/min. The number of detected test particles n should not be higher than 4. A protection factor A_{pf} of at least $1,5 \times 10^5$ can be verified with these values. Thereby, the protection factor is calculated with:

$$A_{pf} = (N \times s) / (10^4 \times n)$$

A new verification procedure which complies with these conditions uses fluorescent test particles. These are released within the safety work bench and collected out of the work bench with impactors used as samplers. The plates of the impactors are evaluated under a fluorescence microscope after the test. In the dark field mode all particles collected are visible, in the fluorescence mode exclusively the fluorescent test particles.

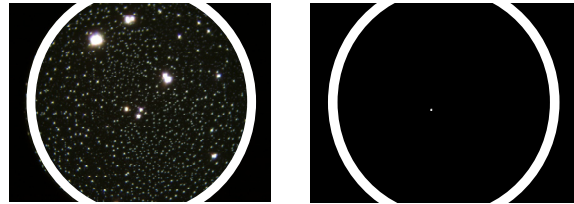


Figure 1. Microscope in the dark field mode (left) and fluorescent mode (right).

Another new verification procedure uses also fluorescent test particles. These are directly detected by an optical particle counter. Exclusive the fluorescence light of the test particles is detected by the selection of suitable light sources, optical filters and photomultipliers. All other particles existing in the ambient air are faded out. A functional prototype of the new particle monitor for fluorescent test particles is introduced.

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DIN 12980 *Laboratory furniture - Cabinets for handling cytotoxic drugs - Requirements, testing.*
EN 12469 *Biotechnology - Performance criteria for microbiological safety cabinets.*