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# Emissions from laser printers and copiers

## Problem

Laser printers and copiers have become a permanent feature of today's offices. The possible health risks from dusts and gases emitted during the operation of such equipment are currently the subject of public debate. The Verwaltungs-Berufsgenossenschaft (institution for statutory accident insurance and prevention in the administrative sector, Administration BG) has requested the IFA to investigate the status quo and recommend protective measures.

## Activities

First of all, conditions that are scarcely realistic even in the worst case scenario were simulated in a small, unventilated test chamber. A number of commercially available colour copiers and black-and-white laser printers of different makes and designs were tested in continuous operation. The measured emissions were ozone, various organic substances (including carcinogenic benzene) and dusts including ultrafine particulates. To account for possible cumulative effects, the collected gases were assessed in the luminous bacteria test (Microtox®).

Toner powders were also subjected to precise examination, e.g. for grain size distribution, dusting behaviour, and the content of metals and volatile organic compounds. In cooperation with the University of Essen, the effect of toner dusts on isolated alveolar macrophages (cells specialising in the removal of foreign matter penetrating into the lung) was studied.

Laser printer in the test chamber

## Results and Application

Even under unfavourable model conditions, the output of dusts of the A- and E-fractions was below the detection limit. When the test equipment was switched on, there was a temporary increase in the emission of ultrafine particulates. With continuing copier/printer operation, the share of larger particles increased.

All copiers/printers emitted volatile organic compounds (VOCs). However, the concentrations were well below the workplace limits and in most cases below the stricter environmental and indoor guide values as well. Ozone evidently is not a problem anymore; most of today's printers/copiers operate without emitting ozone. From the macrophage test, toner dusts can be said to have an irritation and inflammation potential, albeit only at high concentrations.

On the basis of these data, the BG Expert Committee Administration (FA VW) and the IFA prepared a new strategy for the assessment of laser printers and photocopiers. The test criteria only tolerate very low equipment emissions. In cooperation between the BG Expert Committee Administration and the LGA Landesgewerbeanstalt Bayern (Nuremberg), a strict test catalogue was also drawn up for toner powders. The catalogue contains recommended values for metals and organic constituents and is the precondition for the award of the DGUV Test "pollutant-tested" mark.

Finally, the IFA also participated in the revision of the Blauer Engel (Blue Angel) environmental symbol for printers, copiers and multifunctional equipment. After modification of the DGUV Test criteria and the construction of two dynamic test chambers, such standardised tests are now performed routinely at the IFA. Valuable advice on the safe use of laser printers has been summarised by the Administration BG in its document BGI 820 on laser printers.

**Area of Application**

All industrial/commercial circles and users of printers, copiers and multifunctional equipment

**Additional Information**


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**Expert Assistance**

IFA, Division 3: Hazardous substances: handling – protective measures

**Literature Requests**

IFA, Central Division

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