

Testing The Emission From Printers By Means Of Test Chambers

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IV.2 Emission from materials

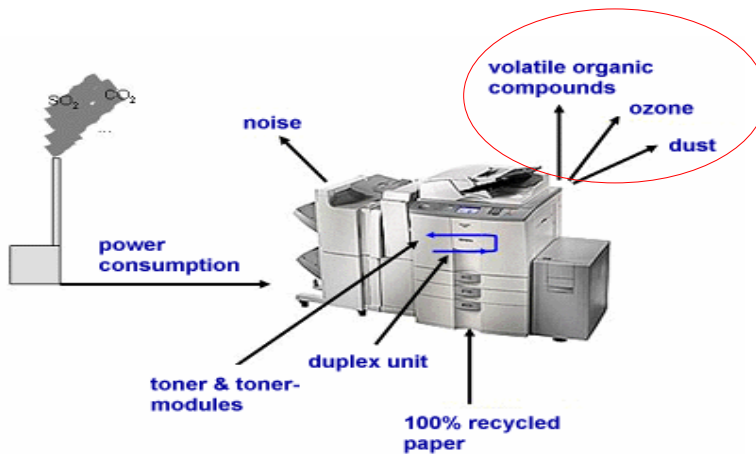
German Environmental Label “Blue Angel”

- Protection of users and the environment
- Environmental friendly products
- Low emission products
- Indoor air quality



IV.2 Emission from materials

German Environmental Label “Blue Angel”



IV.2 Emission from materials

Chemical Emission Testing (compounds)

- Volatile organic compounds (VOC)
 - Benzene
 - Styrene
 - TVOC (sum of VOCs)
- Ozone
- Dust



IV.2 Emission from materials

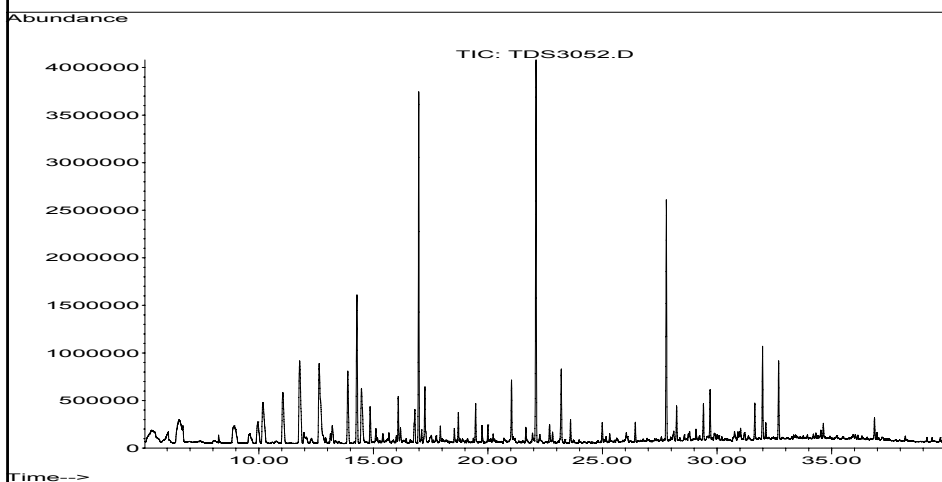
Chemical Emission Testing (sampling)

- Volatile organic compounds (VOC):
 - Adsorption onto Tenax
 - Thermal desorption
 - GC-MS analysis
- Ozone:
 - Online, chemiluminescence detector
- Dust:
 - Collection on glass-fiber filter
 - Gravimetric determination



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Chromatogram of an Chamber Air Sample



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Emission Test Chamber

Requirements:

- Control of Climate (relative humidity and temperature)
- Control of air exchange rate (AER)
- Control of background emissions
- Minimization of adsorption effects (chamber walls made of glass or stainless steel)



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Emission Test Chamber Measurement (1)



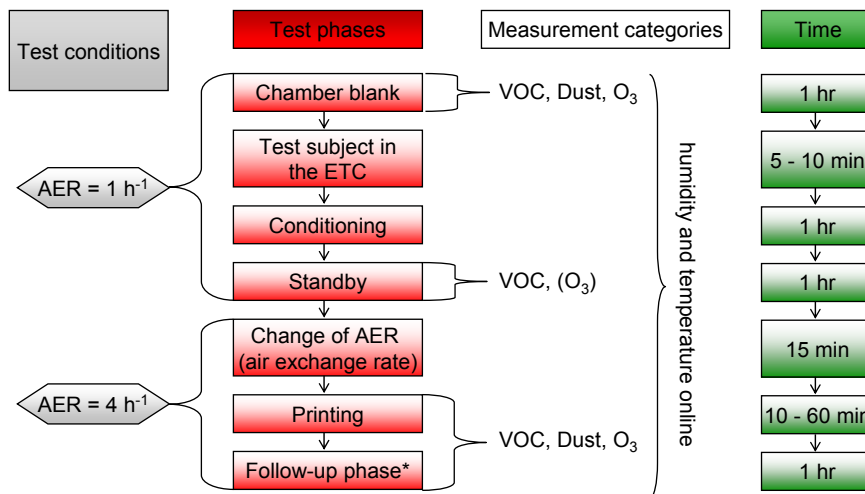
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Emission Test Chamber Measurement (2)



IV.2 Emission from materials

Emission Test Chamber Measurement (3)



*: follows on from the printing phase without opening the chamber.



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Emission Test Chamber Measurement (4)

Calculation of emission rate (mg/h) from measured chamber air concentration:

$$SER_U = n * V * c * t_p / t_o \text{ [mg unit/h]}$$

n: air exchange rate [1/h]

V: chamber volume

c: concentration [$\mu\text{g}/\text{m}^3$]

t_p : printing time

t_o : overall sampling time (depends on AER)



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Emission Test Chamber Measurement (5)

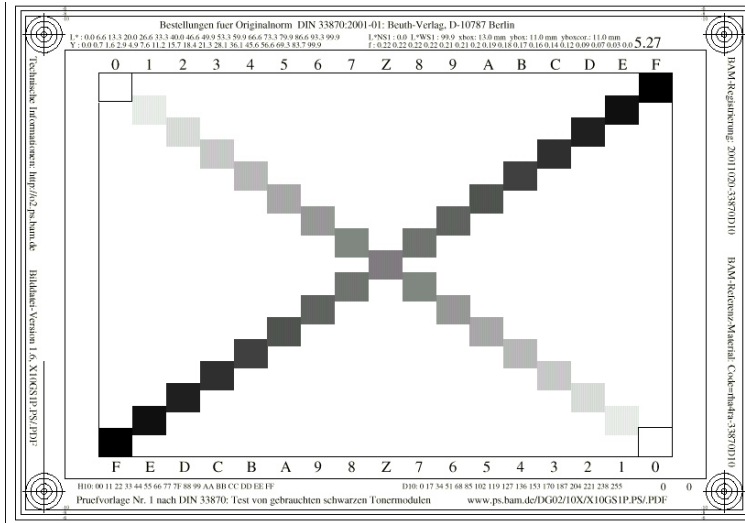
Emission of VOC (and dust) from toner depends on:

- Toner amount per paper sheet
- Toner coverage per paper sheet
- Fusing temperature



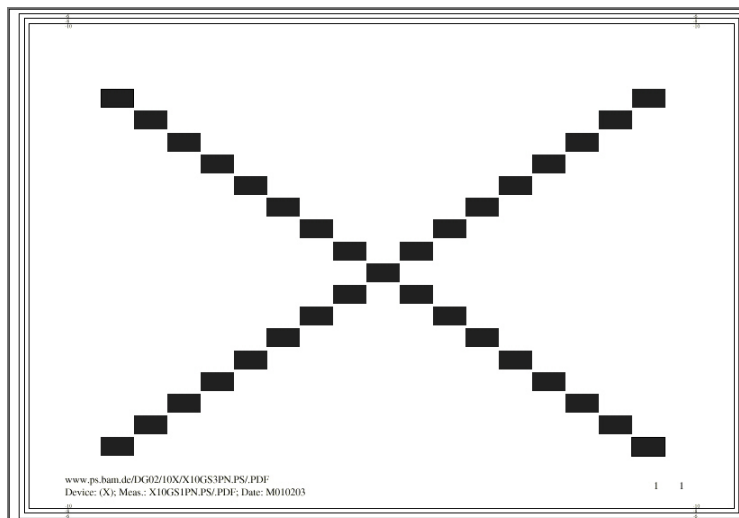
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Monochrome Test Sheet for Printer Calibration (Grey Scale Linearization, DIN 33870)



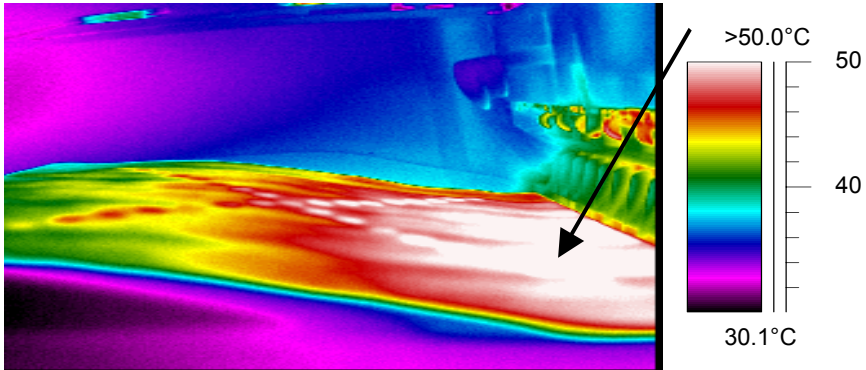
IV.2 Emission from materials

Monochrome Test Sheet for Printing, DIN 33870



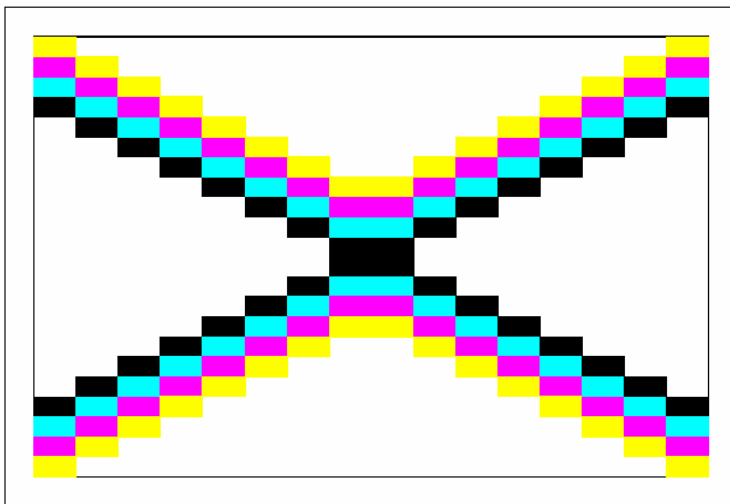
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Paper Temperature after Printing



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Color Test Sheet for Printing



DIN 33870-Prüfvorlage Nr. 0 Stufe: S1 Device: unknown printer name
Ergebnis-Seite: 5% Date: M2002-10-01

Seite: 1a, Seite: 1



IV.2 Emission from materials

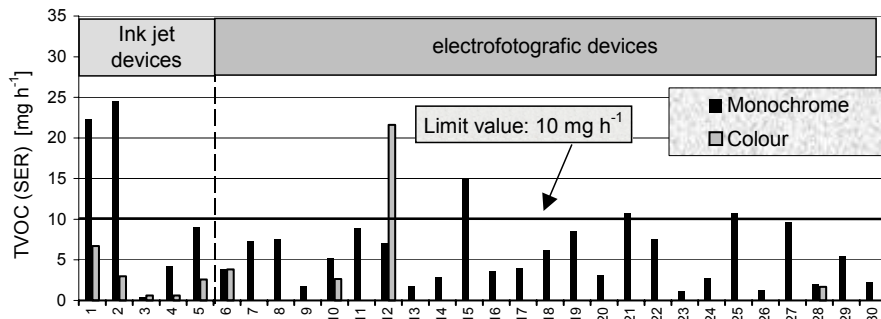
Requirements for the “Blue Angel”

	Printing phase	Standby phase
Emission	[mg/h]	[mg/h]
TVOC	10	1 (3)
Benzene	0,05	-
Styrene	1,0	-
Ozone	2,0	-
Dust	4,0	-



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TVOC Results for Tabletop Devices



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Summary

A method for the testing of chemical emissions from printers, copiers and multifunctional devices was developed by the Federal Institute for Materials Research and Testing (BAM).

Emission test chambers under defined conditions are used to get comparable and reproducible results.

“Blue Angel” requirements for TVOC, benzene, styrene, ozone and dust were set by the Federal Environmental Agency to label low-emission printers.

