
**Information technology — Office
equipment — Determination of
chemical emission rates from
electronic equipment —**

**Part 1:
Using-consumables**

*Technologies de l'information — Équipement de bureau —
Détermination des taux d'émission chimique d'un équipement
électronique —*



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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

ISO/IEC 28360-1 was prepared by Ecma International (as ECMA-328 Part 1) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, Information technology, in parallel with its approval by national bodies of ISO and IEC.

This first edition of ISO/IEC 28360-1, together with ISO/IEC 28360-2, cancels and replaces ISO/IEC 28360: 2015, which has been technically revised. It also incorporates the Technical Corrigendum ISO/IEC 28360: 2015/Cor.1:2016. The main changes compared to the previous edition are as follows:

- This edition was divided into a part for electronic equipment using consumables and a part for electronic equipment not using consumables as follows:
 - Determination of Chemical Emission Rates from Electronic Equipment — Part 1 (using-consumables)
 - Determination of Chemical Emission Rates from Electronic Equipment — Part 2 (not using-consumables)

The purpose of the split was to make the description of test procedures simpler (they included considerable differences between the two equipment categories) and to facilitate users' understanding.

- This edition is fully aligned with "Test method for the determination of emission from Hard Copy Devices" (RAL-UZ 205).

A list of all parts in the ISO 28360 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Globally, governmental agencies, academic institutions, environmental organizations and manufacturers have started to develop methods to determine chemical emissions from electronic equipment. These attempts however, initially resulted in a range of tests from which the results were not necessarily comparable, either qualitatively or quantitatively.

Following the publications of the 1st edition of ECMA-328 in 2001 and the “Test method for the determination of emissions from Hard Copy Devices” (RAL-UZ 122), experts from the BAM and Ecma have collaborated to harmonise methods to determine the chemical emission rates from ICT & CE equipment in the 2nd edition.

In addition to stricter test procedures, the 2nd edition used generalised emission formulae, and their derivations developed in [Annex C](#), to calculate emission rates from concentrations of analytes that are measured in Emission Test Chambers.

The 3rd edition was fully aligned with the 1st edition of ISO/IEC 28360:2007 adopted under ISO/IEC JTC 1 fast track procedure and published in September 2007.

In addition, the 4th edition fixed a number of errata on ISO/IEC 28360:2007 that JTC 1/SC 28 identified.

Following the publications of the 4th edition of ECMA-328 and the “Test method for the determination of emissions from Hard Copy Devices” (RAL-UZ 122), experts from the BAM, WKI, JBMIA and Ecma have collaborated to harmonise methods to determine the Fine Particle (FP) and Ultrafine Particle (UFP) emissions from hard copy devices in the 5th edition.

The 6th edition was aligned with the 2nd edition of ISO/IEC 28360:2012, and it added a new ozone calculation method. “Test method for the determination of emission from Hard Copy Devices” (RAL-UZ 122) has been replaced by “Test method for the determination of emission from Hard Copy Devices” (RAL-UZ 171) published in January 2013. Therefore, “RAL-UZ 122 option” is replaced with “RAL-UZ 171 option” in the 6th edition.

The 7th edition of ECMA-328 is fully aligned with ISO/IEC 28360:2015.

The 8th edition was divided into a part for electronic equipment using consumables and a part for electronic equipment not using consumables as follows:

- Determination of Chemical Emission Rates from Electronic Equipment — Part 1 (using-consumables)
- Determination of Chemical Emission Rates from Electronic Equipment — Part 2 (not using-consumables)

The purpose of the split was to make the description of test procedures simpler (they included considerable differences between the two equipment categories) and to facilitate users’ understanding.

This 8th edition is fully aligned with “Test method for the determination of emission from Hard Copy Devices” (RAL-UZ 205).

This part of the Standard is Part 1.

Information technology — Office equipment — Determination of chemical emission rates from electronic equipment —

Part 1: Using-consumables

1 Scope

This document (all parts) specifies methods to determine chemical emission rates of analyte from ICT & CE equipment during intended operation in an Emission Test Chamber (ETC).

This document (all parts) includes specific methods for equipment using consumables, such as printers, and equipment not using consumables, such as monitors and PC's.

Part 1 specifies the methods to determine chemical emission rates of analyte from electronic equipment using consumables.

The methods comprise preparation, sampling (or monitoring) in a controlled ETC, storage and analysis, calculation and reporting of emission rates.

Emission rates from EUT may also be determined according to additional requirements identified by "RAL-UZ 205 Option".

[Annex A](#) specifies monochrome and colour print patterns for use in the operating phase of EUT using consumables.

The operational readiness of AMS is confirmed according to [Annex B](#).

Calculations use the generalised model and approximations thereof as developed in [Annex C](#).

The emission rates determined with this method may be used to compare equipment in the same class.

Predictions of "real indoor" *concentrations* from the determined *emission rates* are outside the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 16000-3:2011, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*

ISO 16000-6:2011, *Indoor air — Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID*

ISO 16000-9:2006, *Indoor air — Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*

ISO 16017-1:2000, *Indoor, ambient and workplace air — Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography — Part 1: Pumped sampling*

CIE 15:2004, *Commission Internationale de l'Eclairage — Colorimetry, 3rd edition*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

averaged concentration time series

simple moving average of total particle number concentration (C_p) over 31 ± 3 seconds

3.2

averaged ozone concentration time series

simple moving average of ozone concentration (Co_3) over 80 ± 5 seconds

3.3

aerosol

suspension of fine solid particles and/or liquid droplets in a gas

3.4

aerosol measuring system

AMS

device category for measuring the total particle number concentration of an aerosol within a size range at a certain frequency

Note 1 to entry: CPC (4.8) and fast AMS (4.12) belong to AMS.

3.5

air exchange rate

n

ratio (n) of the volume of clean air brought into the ETC per hour [m^3/h] to the unloaded ETC volume [m^3]

3.6

air velocity

air speed [m/s] measured in the unloaded ETC

3.7

analyte

volatile organic compounds (VOC), carbonyl compounds, ozone, particulate matter, fine particles (FP) and ultrafine particles (UFP)

3.8

condensation particle counter

CPC

instrument that measures the particle number concentration of an aerosol

Note 1 to entry: For the purpose of this document a CPC is used as a standalone instrument which measures the total particle number concentration within a device dependent size range.

3.9

consumables

toner, ink, paper and ribbon