HJ

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Technical Requirements for Environmental Labeling Products

Printers, Fax Machines and Multifunction Devices

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Forward

This standard is developed for the purpose of implementing the Environmental Protection Law of the People's Republic of China to reduce the impact of printers, fax machines and multifunction devices on human health and the environment during the production, usage and disposal process as well as protecting the environment.

This standard presents the requirements for energy consumption, noise, limits for toxic and hazardous substances, environmental design, production process, recycling and reuse as well as instruction manual of printers, fax machines and multifunction devices.

This standard has been revised with reference to German Basic Criteria for Award of the Environmental Label "Office Equipment with Printing Function (Printers, Copiers, Multifunction Devices) (RAL-UZ 122, 2009)" and Ecolabel Type No.122 (Printers Version 2.2 2010) of Japan Environment Association as well as "Technical Requirements for Certification of Environmental Labeling Products—Printers, Fax Machines and Multifunction Devices (HJ-T 302-2006)".

The major changes compared with HJ-T 302-2006 are as follows:

— Add the definition of printer, fax machine and so on;
— Revise the requirements for environmental design;
— Revise the requirements for hazardous substances emission limits;
— Revise the requirements for the use of toxic and hazardous substances;
— Revise the limit for energy consumption;
— Add the requirement for CO_2 emission limit;
— Add energy consumption requirement for adaptor;
— Add the requirement for duplex printing;
— Add the requirements for consumables;
— Revise the noise limit for product utilization;
— Revise the annexes of the current standard.

This standard is applicable to the certification of environmental labeling products and certification of low carbon products with China environmental label.

The formulation of this standard is organized by the Department of Science, Technology and Standards of the Ministry of Environmental Protection.

The major organizations in charge of the development of this standard are the Environmental Development Center and National Office Equipment and Consumables Quality Inspection Center.

This standard was approved by the Ministry of Environmental Protection on March 30, 2012.
This standard shall be put into effect as of June 1, 2012.
This standard shall be interpreted by Ministry of Environmental Protection.

The release of previous versions of the standard replaced by this standard are:
——HBC 36-2005 and HJ/T 302-2006.

Technical Requirements for Environmental Labeling Products

Printers, Fax Machines and Multifunction Devices

1. Scope of Application

This standard specifies the definition, basic requirements, technical contents and testing method for environmental labeling product of printers, fax machines and multifunction devices.

This standard is applicable to the printers of standard format,fax machines, and multifunction devices normally working with the power of 220V,50Hz ,including the products using other printing methods (stylus, inkjet, electrostatic imaging, thermal transfer, thermal sensitive, thermal dye sublimation and solid wax injection) .

2. Documents for Standard Quotation

The current standard quotes the articles contained in the following standards. The valid version of any document without a clear indication of date shall be applicable to this standard.

GB 20943 Minimum Allowable Values for Energy Efficiency Evaluating Values of Energy Conservation for Single Voltage External AC-DC and AC-AC Power Supplies
GB 25956-2010 Minimum Allowable Values for Energy Efficiency and Energy Grade for Printers and Fax Machines
GB/T 16288 Marking of Plastic Products
GB/T 16685-2008 Information Technology Equipment— Office Devices —Printing Equipment —Measuring the Throughput of Type I and Type II Printers
GB/T 18313-2001 Acoustics— Measurement of Airborne Noise Emitted by Information Technology and Telecommunications Equipment
GB/T 18455 Package Recycling Marking
GB/T 22372 Test Chart for Laser Printer
HJ/T 238 Technical Requirement for Environmental Labeling Products —Rechargeable Batteries
HJ 570-2010 Technical Requirement for Environmental Labeling Products —Toner Cartridge
HJ 573-2010 Technical Requirement for Environmental Labeling Products — Ink Jet Cartridge
QB/T 2342 Duplicating Paper
ISO/IEC 28360: 2007 Information Technology — Office Devices— Determination of chemical emission rate of electronic equipment

3. Terminology and Definition

GB 25956-2010 and the following terminology and definition shall be applicable to this standard.

3.1 Printers

It refers to the image output equipment that receives the information from computer port, network interface or digital equipment and presents it in media such as paper.

3.2 Fax machines

It refers to the kind of image reproduction equipment with functions of transmitting or receiving graphic and text information. This kind of machines must be able to transmit the data of graphics and text of manuscript to similar equipment through telecommunication network.

3.3 Multifunction devices

It refers to the equipment with printing or fax basic function as well as any one or more additional functions such as copying, scanning, printing and faxing.

3.6 Printing/fax speed [Note1, 2]

It refers to the number of pages of A4 paper printed/faxed per minute with the unit of page/min. It is

expressed by v in the current standard.

Note 1: For stylus printer and product with continuous paper feed, the print/fax speed should take the value of (16 × the maximum media width (unit: m) ×the maximum printing speed(unit: m/min)).

Note 2: For the product only with color printing/fax functions, its printing/fax speed is the speed under color one-side mode.

3.7 Standard format

It refers to the maximum media width at 210.1 mm~ 356.0 mm (such as A3, A4, B4 paper and main paper) of non-continuous feeding product and maximum width of 210.1mm ~ 406.0mm for continuous feeding product.

3.8 Units/component parts

It refers to any unit or component part that is composed of 2 or more parts combined by force or shape.

3.9 Defending/case parts

It refers to the parts that protect the equipment from being influenced by external impacts and prevent user from contacting any movable, luminescent or high-voltage parts.

3.10 Recycled paper

It refers to the paper products manufactured with certain proportion of recycled paper. In the current standard, it refers to the duplicating paper manufactured with recycled paper pulp more than 30%.

4. Basic Requirements

4.1 The quality, safety performances, electromagnetic compatibility and pollution control of the product should meet the requirements of relevant national standards**.**

4.2 The pollution emission of enterprises engaged in the production of the product must meet the requirements of national or local pollution emission standards.

4.3 The product manufacturing enterprise should strengthen clean production during its production process.

5. Technical Contents

5.1 Environmental-friendly requirements for products design

5.1.1 The environmental design of the product should meet the requirements in Annex A.

5.1.2 Deca-BDE and SCCPs shall not be adopted for the base materials of the shell, protection parts and printing circuit board .

5.1.3 Any plastic parts with mass > 25 g except shell and plastic components in protection parts close to heating and imaging components shall not employ polymerized substance containing chlorides or borides or add fire retardant containing organic chlorides or organic borides.

5.1.4 Any plastic parts with mass > 25 g in the product except wire and cable shall not employ phthalates in Annex B as plasticizer.

5.1.5 TBT and TPT shall not be employed in any part and component of the product.

5.1.6 The total content of benzopyrene in shell, various press keys and external power supply cord shall not exceed 20 mg/kg. The total content of 16 kinds of PAHs in Annex C shall not exceed 200 mg/kg.

5.1.7 The battery in product shall meet the requirements of HJ/T 238.

5.1.8 The auxiliary toner cartridge in the product shall meet the requirements of clauses 5.1, 5.2, 5.3, 5.5, 5.6 and 5.7 in HJ 570-2010.

5.1.9 The auxiliary inkjet cartridge in the product shall meet the requirements of clauses 5.1, 5.2, 5.3, 5.5, 5.6 and 5.7 in HJ 573-2010.

5.2 Requirements at production stage

5.2.1 Substances such as HCFCs, $C_2H_3Cl_3$, C_2HCl_3, CH_3CHCl_2, CH_2Cl_2, $CHCl_3$, CCl_4, and C_3H_7Br shall not be used as cleaning solvent.

5.2.2 Lead-free welding technology shall be employed for assembly and connection of parts and components.

5.3 Product requirements

5.3.1Requirement for emission of hazardous substances

5.3.1.1 Dust, ozone, TVOC, styrene and benzene emissions of xerography printing product produced during use and standby process shall meet the requirements of Table 1.

Table 1 Emission Limits of Hazardous Substances from Xerography Printing

Substance			**Emission limit** (mg/h)	
			Black and white printer	Color printer
Dust			≤ 4.0	≤ 4.0
Ozone			≤ 1.5	≤ 3.0
TVOC	Operation		≤ 10	≤ 18
	Standby	Volume > 0.25 m^3	≤ 2.0	≤ 2.0
		Volume ≤ 0.25 m^3	≤ 1.0	≤ 1.0
Styrene			≤ 1.0	≤ 1.8
Benzene			< 0.05	< 0.05

5.3.1.2 TVOC emissions of the products using other printing methods (stylus, inkjet, thermal transfer, thermal sensitive and thermal dye sublimation) should not exceed 18 mg/h. Dust emission of stylus printer should not exceed 4.0 mg/h.

5.3.2 Noise of the product at the maximum printing speed (default mode for inkjet product) should meet the requirements of Table 2.

Table 2 Noise Limit for Product at the Maximum Printing Speed (v , ppm)

Product type	Lwa,dB(A)
Black and white	≤ 59 + 0.35 × v
Color	≤ 61 + 0.30 × v
Stylus printer	≤ 70
Note 1: For serial color product, if the color printing/fax speed ≤ 0.5 black and white printing/fax speed, its sound power level should be identified and indicated and only noise monitoring for black and white printing speed should be tested. Note 2: The noise limits for monocolour printers and color printers shall not exceed 75 dB (A).	

5.3.3 Requirements for energy consumption

5.3.3.1 The energy consumption of the product with printing speed not exceeding 70 ppm should meet Grade II energy efficiency requirement specified in GB 25956-2010.

5.3.3.2 The energy consumption of monocolor printers and fax machines that employ thermal sensitivity, thermal dye sublimation, xerography solid ink-jet and thermal transfer techniques as well as high performance inkjet technology with printing speed over 70 ppm should meet the requirements of Table 3. The energy consumption of other products should meet Grade II energy efficiency requirements at the maximum speed range and power limit of operation mode specified in GB 25956-2010.

Table 3 Typical energy consumption limits for monocolor printers and fax machines

Product type	Printing/fax speed (v)/ppm	Typical energy consumption/kWh
Monocolor printer and fax machine	70 < v ≤ 82	< 0.35× v - 10.3
	v > 82	< 0.70× v – 39.0

5.3.4 Requirement for adaptor

5.3.4.1 The average energy efficiency limit of attached adaptor should meet the requirements of Table 4.

Table 4 Limit for Average Efficiency

Nominal value of output power (P_0)/W	The minimum average efficiency	
	Output voltage≥ 6V	Output voltage < 6V
0< P_0 <1	0.48×P_0+0.140	0.497×P_0+0.067
1≤ P_0 < 49	0.062×In P_0+0.622	0.075×In P_0+0.561
49 ≤P_0≤250	0.870	0.860

5.3.4.2 For the product with adaptor, its energy efficiency limit under idling conditions should meet the requirements in Table 5.

Table 5 Limit for the Average Efficiency Under Idling Condition

Nominal value of output power (P_0)/W	The maximum power under idling conditions	
	AC-AC adaptor	AC-DC adaptor
$1 \leqslant P_0 < 49$	0.5	0.3
$49 \leqslant P_0 \leqslant 250$	0.5	0.5

5.3.5 Requirement for duplex printing
The duplex printing functions employing electrostatic imaging method are shown in table 6. However, they are not applicable to any products employing continuous copying paper.

Table 6 Requirements for Duplex Printing of Printers or Multifunction Devices Employing Xerography Method

Product type	Printing speed (v)/(ppm)	Requirements for duplex printing devices
Monoclour printer	$24 < v < 45$	Option
	$v \geqslant 45$	Standard
Color printer	$19 < v < 40$	Option
	$v \geqslant 40$	Standard

5.3.6 This product may carry out printing with recycled paper and the performances of recycled paper meet QB/T 2342 standard. However, it is not applicable to any product that employs continuous printing paper.

5.4 Packaging requirements
5.4.1 HCFCs should not be employed as foaming agent.
5.4.2 The total contents of heavy metals such as lead, cadmium, mercury and six-valance chromium in package and packaging materials should not exceed 100 mg/kg.
5.4.3 The product should be marked in line with the requirements of GB/T 18455.

5.5 Requirements at product recycling stage
Enterprises should establish the recycling, reuse and treatment system for waste products and their auxiliary toner and ink cartridges and provide relevant information about recycling and reuse of products.

5.6 Requirements for product description
The product description (instruction manual) should be sold together with the product as follows:
a) Descriptions for use and maintenance of the product;
b) Recommendations for equipment with noise > 63dB(A) to be placed in relatively independent area;
c) Information about duplex printing device or the information of option choice for of duplex printing;
d) Information that recommends the use of recycled paper;
e) Descriptions about ventilation at appropriate time in case of long-term utilization or printing large amount of documents in the room with poor ventilation condition;
f) Description of zero energy consumption of the product at energy saving mode, standby mode or no connection with any external power supply;
g) Information and channels for recycling of the product;
h) Information on recycling of used toner cartridges and inkjet cartridges.

5.7 Supply guarantee
5.7.1 Repair and maintenance guarantee
Enterprises should commit to the provision of spare parts that may be damaged under normal use within 5 years at least after ceasing production of the product.

5.7.2 Supply of consumables
Enterprises should commit to the provision of consumables within 5 years at least after ceasing production of the product.

6. Test Method

6.1 The determination of TVOC, benzene and styrene should be conducted in accordance with the methods specified in Annex D. The determination of ozone should be conducted in accordance with the methods specified in Annex E. The determination of dust should be conducted in accordance with the methods specified in Annex F.

6.2 The test of technical contents in 5.3.2 should be carried out in accordance with Section of GB/T 18313-2001. The following conditions should be satisfied before testing:

a) The determination of noise should be conducted under default conditions without involving auxiliary parts;

b) The monocolour printer product should be tested in line with the black-and-white test chart specified in GB/T 22372 or GB/T 18313-2001. The test of color printers should be in line with the color test chart specified in ISO/IEC 28360:2007.

c) The paper with the maximum nominal size for testing (The designated paper should be employed for thermal products);

d) The paper with weight of 60~80 g/m^2 should be employed for testing;

e) In case of testing single product, 3 dB(A) should be added to the test results for judgment.

6.3 The test of technical contents in 5.3.3 should be carried out in accordance with the methods specified in GB 25956-2010. The determination of CO_2 emission should be calculated in line with Annex G.

6.4 The test of technical contents in 5.3.4 should be carried out in accordance with the methods specified in GB 20943.

6.5 Other requirements in technical contents should be verified by document review combined with on-site verification.

Annex A

(Standard Annex)

Requirements for Environmental Design

Classification	Code	Requirements	Target Parts	Remarks
Structure and connection technique	1	Various components composed of incompatible materials can be separated or are connected through auxiliary parts that are easy to separate.	Protection parts, base, electric and electronic components, toner cartridge and inkjet cartridge	-
	2	Electric and electronic components and assembly are easy to be found and separated.	Whole equipment including light tube	-
	3	The disassembly aiming at recycling and reuse could be done with general tools.	Shell, base and electric and electronic assembly	"General tools" refers to the tools that can be bought in market. Specified connection under relevant frame of standard or regulation are not applicable.
	4	The acting point and space are taken into account at design stage.	Protection parts, base, electric and electronic assembly	-
	5	The screws of fixed components can be removed with at most 3 kinds of tools.	Protection parts, base, electric and electronic assembly	Tool categories are determined by the type (e.g. cross recess) and size of tools.
	6	The product can be disassembled by only one person.	Whole equipment	For example, when the undermining angle $\geqslant 90^{o}$, there may be several sliding in combination at the same time in the same direction. However, it may not necessarily be dismantled by one person. The disassembling of 3 or more sliding-in combinations at the same time should be regarded as not meeting the requirement.
	7	No electronic component and part on shell. However, the operation part and the shell with base function should not be applicable.	Protection parts	-
	8	The manufacturing enterprise should carry out trial disassemble in the order of the above 1 ~7.	Whole equipment	-
Selection and marking of materials	9	The plastic part and component with similar functions only employ one kind of material. Any reused part or component is not applicable.	The protection parts, base and mechanical parts with weight > 25g	"Similar functions" refers to the functions such as "tolerance to impact" and "tolerance to abrasion".
	10	The plastic shell with weight > 25g should employ monomer or polymer.	Shell	-
	11	The amount of types of monomer or polymer utilized in plastic shell with weight > 25g should not exceed 4 and is easy to dismantle.	Shell	-
	12	Any plastic parts with mass >25g and the surface area of the maximum plane > 200 mm^2 should be marked based on the requirements of GB/T 16288.	Plastic parts	-
	13	For the label that is not easy to remove from product shell, it	Label	-

		should employ the material same to the sticking position or material not affecting recycling and reuse.		
	14	Electroplating should not be carried out on plastic shell parts.	Shell	-
	15	(a)The coating of plastic parts or components should be limited to the minimum (e.g. the name of manufacturer). Laser Marking does not belong to the "painting" mentioned in the current item. It is not applicable to reused parts and components.	Protection parts, toner cartridge and inkjet cartridge	Painting includes the coating layer, vapor plating and printing.
		(b) The paints not affecting reuse should be employed during painting process. It is suggested that the occupational safety and health conditions of painting workers should be improved and the environmental load should be reduced.	Protection parts, toner cartridge and inkjet cartridge	"The paints not affecting reuse" refer to the paints that are compatible to painted parts and components and do not impede reuse of those parts and components. "Improve occupational safety and health conditions of painting workers" refers to ventilation of painting site and workers wearing protective devices. "Reduce the environmental load" refers to reduction of VOC emissions, more efforts in improving painting technology and treatment equipment as well as use of low VOC paints.
		Meeting either of the above (a) or (b) will be OK.		
	17	Recyclable and recoverable materials and material connection are employed.	The protection parts, base and protection components of both toner and inkjet cartridge	"Recyclable and recoverable materials" refer to the materials same as raw materials that can be used for production. Moreover, the current project examines only the design intention and targets, not actual recycling and reuse.
	18	Regenerated plastics are permitted as part of raw materials. (not applicable to inkjet printer)	The protection parts, base and toner cartridge	"Permit" refers to the permission of use of the materials as long as they meet product design requirements. "Part" refers to the existence of relevant plastic component or part (not necessarily for all parts and components).
	19	The parts and components as well as materials in Annex A.1 are easy to dismantle.	Whole equipment	-
	20	Record material selection based 15 ~ 19.	Shell, base, toner cartridge and inkjet cartridge	-
Long-term use	21	More than 50% parts and components except standard parts can be used for other products of the same generation and with same performances.	Whole equipment	-
	22	Reprocessed modules or reused parts might be allowed (not applicable to inkjet printers).	Whole equipment	The manufacturer should permit reuse of them. Their use may be for repairing spare parts or

				those with quality equivalent to new.
	23	Toner cartridges and inkjet cartridges can be regenerated.	Toner cartridge and inkjet cartridge except single containers	It means no impedance of reuse in design.

Annex Table A.1 Finished Articles, Chemicals and Parts Subject to Separate Treatment

- PCB- containing capacitance
- Mercury-containing parts with the use similar to light tube in backlight
- Battery
- **Print** Circuit Board with area exceeding 10 cm^2
- Toner cartridge, powder, colorant and liquid ink. Also including color toner.
- Plastic parts employing bromine-containing fire retardant
- LCD with area exceeding 100 cm^2 (sometimes fixed on shell)
- External power supply cord
- Capacitance containing hazardous substances (height > 25 mm, diameter >25 mm or similar volume)

Annex B

(Standard Annex)

Phtalates banned in plastic parts and components

Chinese Name	English Name	Abbreviation
邻苯二甲酸二异壬酯	Di-iso-nonylphtalate	DINP
邻苯二甲酸二正辛酯	Di-n-octylphtalate	DNOP
邻苯二甲酸二（2-乙基已基）酯	Di- (2-ethylhexyl)- phtalate	DEHP
邻苯二甲酸二异癸酯	Di-isodecylphtalate	DIDP
邻苯二甲酸丁基苄基酯	Butylbenzylphtalate	BBP
邻苯二甲酸二丁酯	Dibutylphtalate	DBP

Annex C

(Standard Annex)

PAHs subject to restriction

Chinese name	English name	Abbreviation
萘	Naphthalene	Nap
苊烯	Acenaphthylene	AcPy
苊	Acenaphthene	Acp
芴	Fluorene	Flu
菲	Phenanthrene	PA
蒽	Anthracene	Ant
荧蒽	Fluoranthene	FL
芘	Pyrene	Pyr
1,2-苯并菲	Chrysene	CHR
苯并（a）蒽	Benzo[a]anthracen	BaA
苯并（b）荧蒽	Benzo[b]fluoranthene	BbF
苯并（k）荧蒽	Benzo[k]fluoranthene	BkF
苯并芘	Benzo[a]pyrene	BaP
二苯并（a, h）蒽	Dibenzo[a,h]anthrancene	DBA
茚并（1,2,3-cd）芘	Indeno[1,2,3-cd]pyrene	IND
苯并（g, h, i）苝（二萘嵌苯）	Benzo[g,h,i]perylene	BghiP

Annex D

(Standard Annex)

Procedures for the determination of TVOC, benzene and styrene

D.1 Scope of application

The current method is applicable to the determination of TVOC, benzene and styrene emission rate of printer, fax machine and multifunction device under operation status.

D.2 Method and mechanism

Choose appropriate Tenax TA, employ an adsorption tube to collect certain volume of air sample. The VOC in air flow will retain in the tube. After sampling, heat the adsorption tube to analyze VOCs. The subject sample goes into capillary gas chromatograph with inert gas. Employ retention time for qualifying of time and peak area for quantifying.

D.3 Test Conditions

D.3.1 The test chamber shall meet the following conditions:

a) Temperature: 23℃±2℃;

b) Relative humidity: 50% ±5%;

c) Air exchange rate: Volume of test chamber ≤5 m^3: (1 ≤n ≤5) ±5%;

Volume of test chamber > 5 m^3: (1 ≤n ≤2) ±5%;

d) Blank value of test chamber: The blank value should meet the following requirements when air exchange rate n = 1/h:

Individual substance < 2 μ g/m^{-3}

TVOC < 20 μ g/m^{-3}

e) Flowrate of test chamber: 0.1~0.3 m/s;

f) Volume of test chamber: $0.01< V_{EUT}/V_K<0.25$

V_{EUT}: the volume of test sample

V_K: the volume of test chamber

D.3.2 Instrument and equipment

a) Gas chromatograph (GC) or Gas chromatograph – mass spectrometer (GCMS);

b) Thermal analyzer;

c) Air sampler;

d) Colorimeter;

e) Power meter

D.3.3 Test chart

a) Monocolour stylus products employ the test chart A specified in GB/T 16685-2008, A4 size; or black test chart specified in ISO/IEC 28360:2007, A4 size;

b) Monocolour inkjet products employ the graphic test chart specified in GB/T 16685-2008 or black test chart specified in ISO/IEC 28360:2007, A4 size;

c) Monocolour xerography products employ the black test chart specified in GB/T 22372-2008 or ISO/IEC 28360:2007;

d) Color printing products employ the color test chart specified in ISO/IEC 28360:2007.

D.3.4 Test paper [Note 1]

A4 ordinary copying paper with 60~80 g/m^2 should be utilized.

Note 1: Stylus printer should employ the paper with the maximum nominal size of the product.

D.3.5 Product settings

a) The printing speed should choose the default value;

b) The functional mode should be set at printing status. The functional mode of the products without printing function should be set at duplicating status. When fax machine does not have duplicating function, the task should be conducted through telephone line delivery.

D.3.6 Placement of product and its consumables

The product and its consumables should be placed into test chamber one day before the test.

D.4 Test Method

D.4.1 Sampling at preparation stage (Standby) Note 2

It should be conducted based on the following procedures:

a) Connect sampling tube with air sampler and set the flow rate of air sample at 0.1~0.2 L/min;

b) Set the air exchange rate of test chamber at n = 1/h;

c) Switch on the power for 40 minutes, then sample TVOC for 20 minutes. Immediately seal the two ends of the sampling tube soon after the sampling.

Note 2: Employ flowmeter to calibrate the flow of air sampler and record it, the flow tolerance should < 5%.

D.4.2 Sampling at printing and post-printing stage

The sample should be collected based on the following procedures:

a) Replace the sampler tube and connect it with air sampler with no change of the set flow;

b) The air exchange rate is set at n = 1~ 5/h (volume≤ $5m^3$) or n = 1~2/h (volume > $5m^3$);

c) Print with the specified test chart as the original copy based on product type, it should work continuously over 10 minutes; Note3, 4

Note 3: For any product that cannot continuously work for 10 minutes, the maximum continuous working time should be chosen for printing.

Note 4: Dynamometers shall be used to monitor the operating state of the products in the process of test.

d) Continue the sampling till the completion of air exchange. Immediately seal up the two ends of sampling tube soon after the sampling;

e) Take the color printing materials, employ a colorimeter to test its color values L, a and b and record them.

D.4.3 Sample analysis

Employ a thermal analyzer + GC or GCMS to analyze the sample.

D.5 Calculation

D.5.1 Calculation of VOC emission rate at preparation (standby) stage

VOC emission rate at preparation (standby) stage should be estimated based the concentration of 20 min sample with the help of the following Formula:

$$SER_B = C_B \times n_B \times V \qquad C_B = (m_{VOC\text{-}B})/V_p \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (D1)$$

Where

SER_B — the VOC emission rate at preparation (standby) stage, μg/h;

C_B — the VOC concentration at preparation (standby) stage, μg/m^3;

n_B— air exchange rate during and after printing, h^{-1};

V— volume of test chamber, m^3;

$m_{VOC\text{-}B}$ — the mass of VOC sample at preparation (standby) stage, μg;

V_p— the volume of VOC sample at preparation (standby) stage, m^3.

D.5.2 Calculation of VOC emission rate during and after printing

The Formula that estimates VOC emission rate during and after printing:

$$SER_{DN} = m_{VOC\ DN} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (D2)\text{缺公式}$$

Where

SER_{DN} — VOC emission rate during and after printing, μg/h;

$m_{VOC\ DN}$ — post-analysis VOC mass during and after printing, μg;

V_p— sampling volume during and after printing, m^3;

n_{DN}— air exchange rate during and after printing, h^{-1};

V— volume of test chamber, m^3;

t_G— total sampling time during and after printing, h;

SER_B — VOC emission rate at preparation (standby) stage, μg/h;

t_D— operation time at printing stage, h.

D.5.3 Calculation of emission rate of unidentified VOC

The response coefficient of toluene is employed to estimate the concentration of unidentified VOC.

The VOC emission rate at the preparation (standby) stage is calculated with Formula D1 and that during and after printing stage is calculated with Formula D2.

D.5.4 Calculation of TVOC emission rate

D.5.4.1 TVOC emission includes the sum (SER_{DN}+SER_B) of all substances (both known and unknown) with the retention time ranging from n-hexane to n-hexadecane. However, the substances with emission rate less than the followings are exception:

Test chamber with volume $\leqslant$ 5 m^3: SER_B 0.005 mg/h, SER_{DN} 0.05 mg/h.

Test chamber with volume > 5 m^3: SER_B 0.02 mg/h, SER_{DN} 0.2 mg/h.

D.5.4.2 Calculation of benzene emission rate

The benzene concentration in VOC measurement is employed to estimate its emission rate with the help of Formula D1 for preparation stage and Formula D2 for printing and post-printing stage.

D.5.4.3 Calculation of styrene emission rate

The styrene concentration in VOC measurement is employed to estimate its emission rate with the help of Formula D1 for preparation stage and Formula D2 for printing and post-printing stage.

Annex E

(Standard Annex)

Ozone determination procedures

E.1 Scope of application

The current method is applicable to the determination of ozone of printer, fax machine and multifunction devices under working status.

E.2 Method and mechanism

When air sample flows into the air path system of the instrument at certain rate, the sample air alternately or directly enters absorption cell or an ozone scrubber followed by absorption cell; Ozone has characteristics absorption of ultraviolet light with wavelength at 254 nm. The micro-processing system of the instrument will obtain ozone concentration based on Lambert-Beer's Law for each cycle.

E.3 Test conditions

E.3.1 The test chamber should meet the following conditions:

a) Temperature: 23℃±2℃;

b) Relative humidity: 50% ±5%;

c) Air exchange rate: Volume of test chamber ≤5 m^3: (1 ≤n ≤5) ±5%;

Volume of test chamber > 5 m^3: (1 ≤n ≤2) ±5%

d) Blank value of test chamber: The ozone half-life period should be >10 minutes and ozone concentration < 4 μ g/m^3 when air exchange rate n = 1/h

e) Flow-rate of test chamber: 0.1~0.3 m/s;

f) Volume of test chamber: $0.01< V_{EUT}/V_K<0.25$

V_{EUT}: volume of test sample

V_K: volume of test chamber

E.3.2 Instrument and equipment

a) ultraviolet spectrophotometry ozone analyzer

b) barometer

E.3.3 Test chart

a) Monocolour printing product should employ the black sample page described in GB/T 22372-2008 or ISO/IEC 28360:2007.

b) Color laser printing product should adopt the color sample page described in ISO/IEC 28360:2007.

E.3.4 Test paper

Ordinary A4 sized copying paper with 60~80 g/m^2 should be utilized.

E.3.5 Product setting

a) The printing speed should be the default value.

b) The working status of the product should be set "printing". The product without printing function should be set "duplicating".

E.3.6 Placement of the product and its consumables

The product and its consumables should be placed into test chamber one day earlier before the test.

E.4 Test method

E.4.1 Sampling time

The collection of ozone sample should start from printing stage and continue to post-printing stage.

E.4.2 Test procedures

The determination should be carried out according to the following procedures:

a) Connect sampling line and get access to ozone analyzer;

b) Set air exchange rate at n = 1~5/h (volume ≤5 m^3) or n=1~2/h (volume >5 m^3);

c) Employ the specified test chart as original copy for printing and it should work continuously for over 10 minutes. Note 1

Note 1: For any product that cannot continuously work for 10 minutes, the maximum continuous working time should be chosen for printing.

E.5 Calculation of ozone emission rate

Formula (E1) can be employed to estimate ozone emission rate:

$$SER_u = (C_{max} \times k' \times V \times P)/(T \times R) \qquad k' = \ln 2/H' \quad \text{.....(E1)}$$

Where

SER_u — ozone emission rate, μg/min;

C_{max} — the maximum ozone concentration of initial 10min at printing stage and after the end of printing, μg/m^3;

k' — proportion factor, min^{-1};

V— volume of test chamber, m^3;

P— air pressure, Pa;

T— absolute temperature, K;

R— air constant; Pa/K (339.8 Pa/K for ozone);

H' — Half-life of ozone under test conditions, min.

Annex F

(Standard Annex)

Dust determination procedures

F.1 Scope of application

The current method is applicable to the determination of dust of printer, fax machine and multifunction device under working status.

F.2 Method and mechanism

Dust sampler is employed to take indoor air sample. Measure the air volume going through the filter; and estimate dust concentration and emission rate based on the absolute weight and injection rate before and after the sampling.

F.3 Test conditions

F.3.1 The test chamber should meet the following conditions:

a) Temperature: 23℃±2℃;

b) Relative humidity: 50% ±5%;

c) Air exchange rate: Volume of test chamber ≤5 m^3: (1 ≤n ≤5) ±5%;

Volume of test chamber > 5 m^3: (1 ≤n ≤2) ±5%;

d) Blank value of test chamber: The blank value of dust should be< 10 μ g/m3 when air exchange rate n = $1/h^{-1}$;

e) Flow rate of test chamber: 0.1 ~ 0.3 m/s;

f) Volume of test chamber: $0.01< V_{EUT}/V_K<0.25$

V_{EUT}: volume of test sample

V_K: volume of test chamber.

F.3.2 Instrument

a) Constant flow dust sampler (glass fiber filter);

b) Precise electronic analytical balance.

F.3.3 Test chart

a) The monocolour stylus printer should employ A4 sized sample A described in GB/T 16685-2008 or A4 sized black sample described in ISO/IEC 28360:2007;

b) The monocolour xerography printer should employ the black sample described in GB/T 22373-2008 or ISO/IEC 28360:2007;

c) Color printer should employ color sample described in ISO/IEC 28360:2007.

F.3.4 Test paper

Ordinary A4 sized duplicating paper with 60~80 g/m^2. Note 1

Note 1: Stylus printer should utilize the nominal maximum sized paper.

F.3.5 Product setting

a) Printing speed should choose the default value;

b) The working status should be set at “printing”. The product without printing function should be set at “duplicating” status.

F.3.6 Sampling conditions

a) Sampling location: the center of test chamber;

b) Sampling volume rate: ≤80% air exchange rate of the test chamber.

F.3.7 Placement of the product and its consumables

The product and its consumables should be placed in the test chamber one day earlier before the test.

F.4 Test method

F.4.1 Weighing of filter

Employ an electronic balance to weigh the mass of the 2 filters with record. One of the filters will be stored as reference filter.

F.4.2 Sampling time

Dust sample collection should start at printing stage and end till the completion of 4 times of air exchange.

F.4.3 Determination procedures

F.4.3.1 Weighing of sample

Employ an electronic balance to weigh the mass of reference filter and post-sampling filter.

F.4.3.2 Follow the following procedures:

a) Connect dust sampler and set the parameters;

b) Set air exchange rate n = 1~5/h (volume $\leqslant$ 5 m^3) or n = 1~2/h (volume > 5 m^3)

c) Set printing parameters and employ the specified test chart as original copy for over 10 minute's printing. Note 2

Note 2: For any product unable to continuously work for 10 minutes, the maximum continuous working time should be chosen for printing.

F.4.3.3 Correction of sample humidity

The determination of absolute dust mass in the filter (humidity correction)

$$M_{St} = (m_{MF\text{-}gross} - m_{MF\text{-}tare}) + (m_{RF\text{-}1} - m_{RF\text{-}2}) \quad \text{(F1)}$$

Where

m_{St} — mass of the weighed dust (after humidity correction), μg;

$m_{MF\text{-}gross}$ — mass of the measured filter under specified conditions after dust sample collection, μg;

$m_{MF\text{-}tare}$ — mass of the measured filter under specified conditions before dust sample collection, μg;

$m_{RF\text{-}1}$ — mass of reference filter simultaneously weighed with measured filter under specified conditions before dust sample collection, μg;

$m_{RF\text{-}2}$ — mass of reference filter simultaneously weighed with measured filter under specified conditions after dust sample collection, μg;

F.5 Estimate of dust concentration and emission

$$SER_{ust} = (m_{st} \times n \times V \times t_G)/(V_p \times t_D) \qquad C_{st} = m_{st}/V_p \quad \text{(F2)}$$

Where

SER_{ust} — dust emission rate, μg/h;

m_{st} — mass of the weighed dust (after humidity correction), μg;

n — air exchange rate, h^{-1};

V — volume of the test chamber, m^3;

t_G — total sampling time, h;

t_D — total printing or duplicating time, h;

C_{st} — dust concentration in test chamber, μg/m^3;

V_p — air volume going through glass fiber filter paper, m^3.

Annex G

(Standard Annex)

Method for calculation of carbon dioxide emissions

G.1 Method for calculation of CO_2 conversion coefficient for power industry

Carbon dioxide conversion coefficient of power industry (EF) is calculated based on the on-grid electricity of all power plants and fuel CO2 emissions in 2007 described in the *Circular on Publishing Baseline Emission Factors of Regional Power Grids of China in 2009* as well as the basic data on total generated power and thermal power generation in 2007 described in China Statistics Year Book 2009.

The conversion thinking is as follows:

(1) Regional thermal power generation and CO_2 emission of each region are obtained from the *Circular on Publishing Baseline Emission Factors of Regional Power Grids of China in 2009* with data in Table G.1.

Table G.1 Thermal power generation and CO2 emission of each region in China

Region	Thermal power generation (MWh)	CO2 emission (t)
Power grid of North China	776,346,330	754,731,124
Power grid of Northeast China	202,542,560	219,122,791
Power grid of East China	635,331,510	535,305,699
Power grid of Central China	377,233,680	415,974,066
Power grid of Northwest China	178,920,940	180,940,805
Power grid of South China	358,850,130	347,695,831
Power grid of Hainan Province	9,244,530	7,365,050

Formula G1 is employed to estimate EF of national power grid based on total thermal power generation and CO_2 emission.

$$EF_y = \Sigma EQ_{area,y} / \Sigma EG_{area,y} \quad \text{(G1)}$$

Where

EF_y — thermal power CO_2 conversion coefficient of national power grid in year y, t/MWh;

$EQ_{area,y}$ — CO_2 emission of regional power grid in year y, t;

$EG_{area,y}$ — regional thermal power generation in year y (excluding the power generation from low cost/power plants (generation units) that must operate), MWh;

y — the year of the data.

(2) The current standard assumes zero CO_2 emission of the electricity generated by other forms of energy except thermal power generation. Then, Formula G2 is employed to estimate CO_2 conversion coefficient of national power grid EF'_y based on total power generation (32815.5 billion kWh) and thermal power generation (27229.3 billion kWh) described in China Statistics Year Book 2009.

$$EF'_y = (EF_y \times EG_y) / EG'_y \quad \text{(G2)}$$

Where

EF'_y — CO_2 conversion coefficient of national power grid in year y, t/MWh;

EF_y — CO_2 conversion coefficient of national thermal power grid in year y, t/MWh;

EG_y — thermal power generation of power system in year y (excluding the power generation from low cost/power plants (generation units) that must operate), MWh;

EG'_y — total power generation of power system in year y, MWh;

y — the year of the data.

The calculation results: $EF'_{2007} = 0.8045$ t/MWh = 0.8045 kg/kWh.

G.2 Method for calculation of CO_2 emission

G.2.1 Calculation of carbon dioxide emission of printing product that prints standard size by thermal,

thermal sublimation, xerography, solid wax injection, thermal transfer and high-performance ink jet technologies.

Carbon dioxide emission is obtained by multiply electricity consumption with CO2 conversion coefficient of power industry, which is estimated with Formula G3:

$$M = EF'_{2007} \times Q \quad \text{.....(G3)}$$

Where

M — Carbon dioxide emission per week resulting from printing standard size with thermal, thermal sublimation, xerography, solid wax injection, thermal transfer and high-performance ink jet technologies by way of the test method specified in Annex A of GB 25956-2010, kg.

EF'_{2007} — CO_2 conversion coefficient of national power grid, kg/kWh;

Q— typical energy consumption, kWh.

Carbon dioxide emission of the product is estimated based on the above Formula.

G.2.2 Calculation of carbon dioxide emission rate of printing product that prints standard size by ink jet injection or stylus impact under sleep mode.

Carbon dioxide emission is obtained by multiply power with CO2 conversion coefficient of power industry , which is estimated with Formula G4:

$$M = EF'_{2007} \times P \quad \text{.....(G4)}$$

Where

M — Carbon dioxide emission rate resulting from printing standard size with ink jet injection or stylus impact technologies under sleep mode by way of the test method specified GB 25956-2010, g/h.

EF'_{2007} — CO2 conversion coefficient of national power grid, kg/kWh;

P — Power of operation mode, W.

Carbon dioxide emission rate of the product is estimated based on the above Formula.

Baseline Emission Factors of Regional Power Grids of China released by NDRC and total power generation and thermal power generation published by National Bureau of Statistics renew the baseline emission factor of every region of China each year. Therefore, the CO_2 conversion coefficient of power industry employed by China Environmental Labeling Standard for Low Carbon Products should be renewed based on the latest data. CO_2 emissions are judged by if energy consumption meet relevant criterion. In practical test, if energy consumption meets relevant requirements, it is considered that CO_2 emission will meet relevant criterion, too.